MetroX™ InfiniBand Long Haul System Hardware User Manual

P/N: MTX6100-2SFS

Rev 1.1

www.mellanox.com

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Revision History

Table 1 - Revision History Table

Date	Revision	Description
January 2013	1.1	Fixed - 2 power supplies no wire bale
December 2012	1.0	Initial release

About this Manual

This manual describes the installation and basic use of the Mellanox MetroX Long Haul switch which is based on the SwitchX®-2 switch device.

Intended Audience

This manual is intended for users and system administrators responsible for designing and testing switch platforms.

Related Documentation

Additional Documentation available from Mellanox:

Table 2 - Reference Documents and Web Sites

Document Name	Description
InfiniBand Architecture Specification, Volume 1, Release 1.2.1	The InfiniBand Architecture Specification that is provided by IBTA
Mellanox SwitchX®-2 Switch Products Release Notes	For possible hardware issues see the switch support product page. This requires a customer support login.
Mellanox MLNX-OS™ SwitchX-2 Software User Manual	This document contains information regarding configuring and managing Mellanox Technologies' SwitchX-2 Switch Platforms.
MLNX-OS Software Command Reference Guide	Command Reference Guide for ***MLNX-OS*** listing all of the commands available through ***MLNX-OS*** with explanations and examples.
MLNX-OS Software Configuration Guide	Configuration Guide for ***MLNX-OS*** displaying different configuration scenarios.

All of these documents can be found on the Mellanox Website. They are available either through the product pages or through the support page with a login and password.

Conventions

Throughout this manual, the name TX6100 and the term switch are used to describe the , switch unless explicitly indicated otherwise.

The following icons are used throughout this document to indicate information that is important to the user.

This icon makes recommendations to the user.

This icon indicates information that is helpful to the user.

This icon indicates a situation that can potentially cause damage to hardware or software.

BEWARE! This icon indicates a situation that can potentially cause personal injury or damage to hardware or software.

Abbreviations

FDR — Fourteen Data Rate

Mellanox Part Numbering Legend

Place	Field	Decoder
M		Mellanox
TX	System Type	MetroX based systems
6		Family generation
1	Data Transfer Protocol	1 – IB, 2 – ETH
0	Height of box	Height 0 – 1U, 1 – 1.5U, 2 – 2U
0		Switch generation
-	Separator	
2	# Power Supplies	# of PSUs
S	Depth of the Unit	S – standard, B – short
F	Air Flow direction	F – forward air flow, R – Reverse air flow
S	Chip Generation	S – SwitchX-2

1 Overview

The TX6100 MetroX™ series extends InfiniBand from a single-location data center network to a high-performance technology for local, campus and even metro applications.

Data centers, compute clusters and supercomputers are overwhelmed by unprecedented growth in data volume, fueled by strong application and technology trends.

While InfiniBand products have been traditionally deployed for their high-performance interconnect benefits within the data center, Mellanox MetroX switches, implementing long-haul InfiniBand, enable connecting between data centers deployed across multiple geographically distributed sites, extending the same world-leading interconnect benefits of InfiniBand beyond local data centers and storage clusters.

Mellanox's MetroX is the perfect cost-effective, low power, easily managed and scalable solution that enables today's data centers and storage to run over local and distributed InfiniBand fabrics, managed as a single unified network infrastructure.

MetroX switches, which implement long-haul InfiniBand, can transfer data to distances of up to 10km. The switches enable aggregate data and storage networking over a single, consolidated InfiniBand fabric. The long-haul InfiniBand technology guarantees high-performance, high-volume data sharing between distant sites, enabling existing data centers expansion, disaster recovery, data mirroring and campus connectivity.

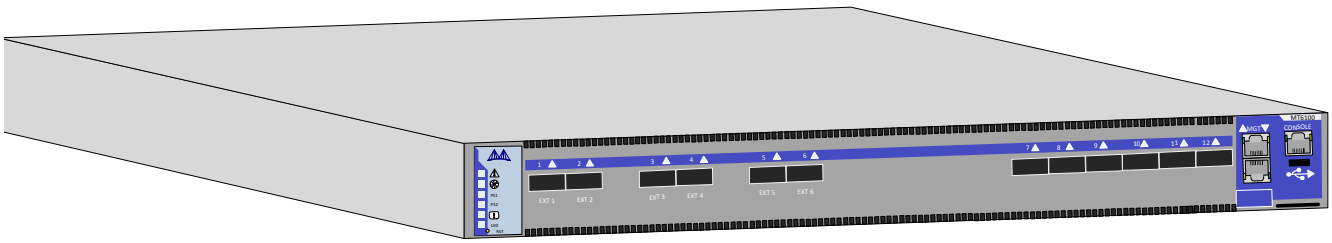
MetroX enables a campus network to assemble large aggregate clusters, all connected and easily managed by an InfiniBand Subnet Manager - an embedded manager, OpenSM, or using Mellanox's Unified Fabric Manager™ (UFM™).

MetroX extends InfiniBand protocol RDMA capabilities beyond the local cluster and ensures RDMA enhancements to both data centers and storage clusters alike.

The switch comes pre-installed with all necessary firmware and is configured for standard operation within an InfiniBand fabric. See Section 9 on page 49 for more information.

Installation, hot-swapping components and hardware maintenance is covered in "Basic Operation" on page 12.

Figure 1: Connector Side View of the Switch



1.1 Features

1.1.1 Full Feature List

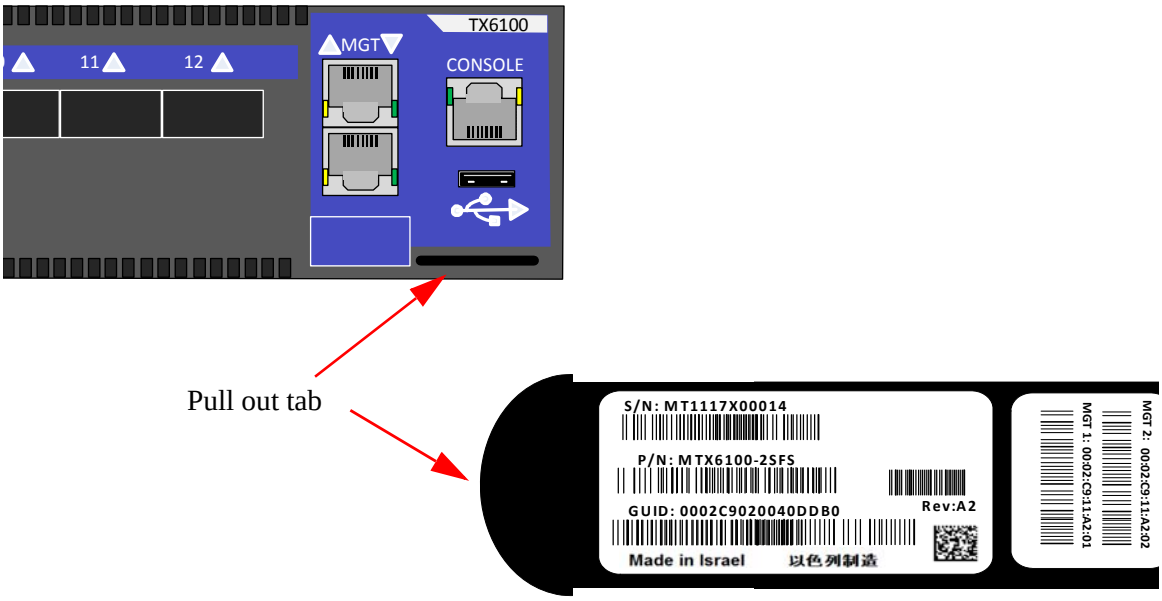
- 6 FDR10 (40Gb/s) QSFP Long haul ports (aggregate data throughput up to 240Gb/s)
- 6 FDR (56Gb/s) QSFP down link ports (aggregate data throughput up to 336Gb/s)

- IBTA 1.3 and 1.21 compliant
- FDR10 supports 20% more bandwidth over QDR using the same cables/connectors**
- QoS (2 Virtual Lanes)
- InfiniBand connectivity to up to 10km
- RDMA over long distance
- 19’’ rack mountable chassis, 1U with redundant power supplies and Fan units
- 6 Downlink QSFP+ non blocking ports with aggregate data throughput up to 336Gb/s (FDR)
- 6 Uplink QSFP+ non-blocking ports with aggregate data throughput up to 240Gb/s
- Compliant with IBTA 1.2.1 and 1.3
- Virtual Lanes - 2 data + 1 management

1.2 Serial Number and Product Version Information

The serial number and GUIDfor the switch is found on the pull out tab below the USB connector. TheMAC for the Management PC is also on this tab. This MAC is for the mgmt0 management interface (the top Ethernet port). The second interface mgmt1 has the next consecutive MAC.

Figure 2: Pull out tab



2 Basic Operation

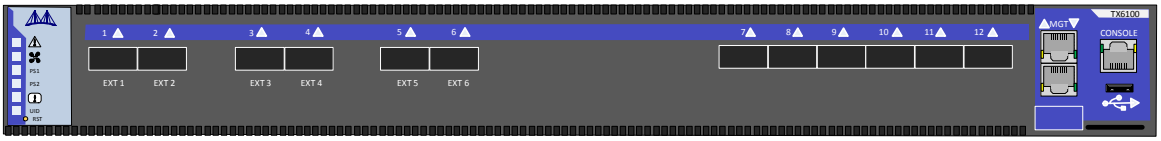
2.1 Switch Platform Hardware Overview

Figure 3 shows the power side panel view of the switch. The figure shows the hot-swap power supply locations and the hot-swap fan module, and an I2C banana connector.

The figure also shows the connector side panel views of the managed switch. The figure shows port configurations for the switch systems. Managed systems have 2 – Ethernet RJ-45 connectors for management, 1 – RJ-45 connector for connecting to a host PC, 1 – USB connector. All switches have various status LEDs for on site switch status information.

Figure 3: QSFP Switch System Power and Connector Side Panels

Power Side Panel



Connector Side Panel

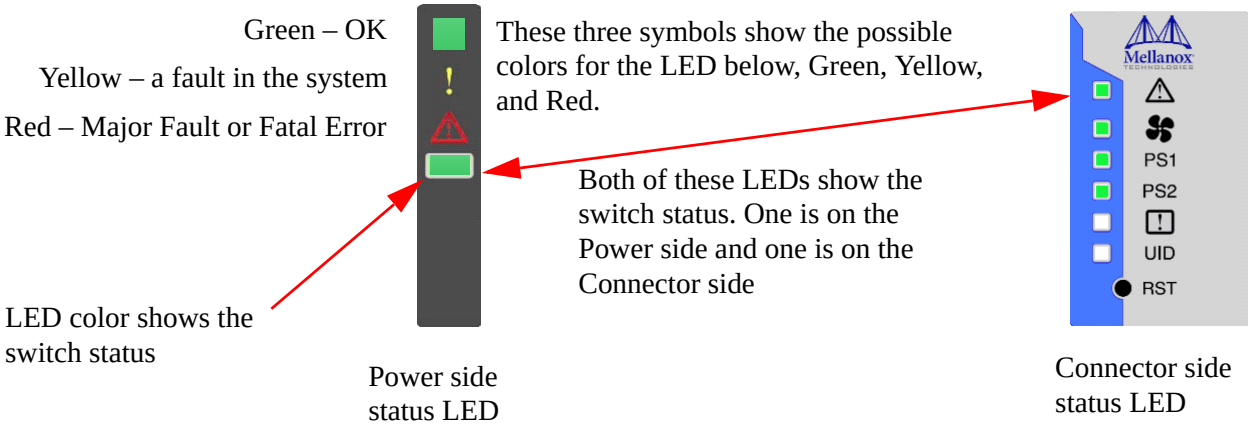
All connectivity except for power cords is via the connector side panel. All connectors can support active cables.

2.1.1 Status LEDs

2.1.1.1 System Status Indicators

The System Status Indicators are located to the left of the connectors on the connector side panel, and on the power side at the far right. Both of these LEDs give identical information.

Figure 4: System Status Indicators


Green – OK
Yellow – a fault in the system
Red – Major Fault or Fatal Error
These three symbols show the possible colors for the LED below, Green, Yellow, and Red.
Both of these LEDs show the switch status. One is on the Power side and one is on the Connector side
LED color shows the switch status
Power side status LED
Connector side status LED
Mellanox
PS1
PS2
UID
RST

The system status indicators should display as follows:

- When the switch is plugged in, within five minutes the STATUS LED should light up green.
- The PS1 LED for the plugged in PS unit should light up green
- The PS2 LED for the second PS unit should light up green only if a second PS unit is installed in the switch for redundancy and Hot-Swap ability and it is connected to a power source.
  - If two PS units are installed and only one PS unit is connected to a power supply the PS2 LED will be red.
  - If only one PS unit is installed in the switch, the PS2 LED will be off.
- The FAN LED should light up green.

As long as there is power to the switch (one PS unit is connected), and the switch is booted up and running, the status LED should be green.

If the STATUS LED shows red after five minutes, unplug the switch and call your Mellanox representative for assistance.

If the FAN LED shows red, troubleshoot the fan module. See “Troubleshooting” on page 51.

If the switch shuts down due to over temperature, unplug the switch, wait 5 minutes and replug in the switch. For more information See “Troubleshooting” on page 51.

If the PS LEDs are not green, this indicates a problem with the power supplies. The switch is operational only if at least one of the PS LEDs is green.

Power, Fan, and System LEDs

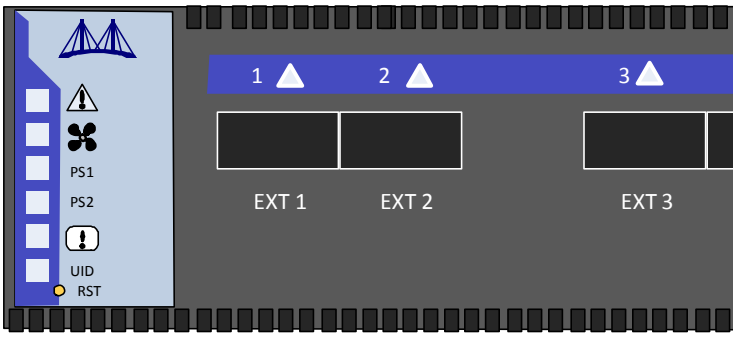


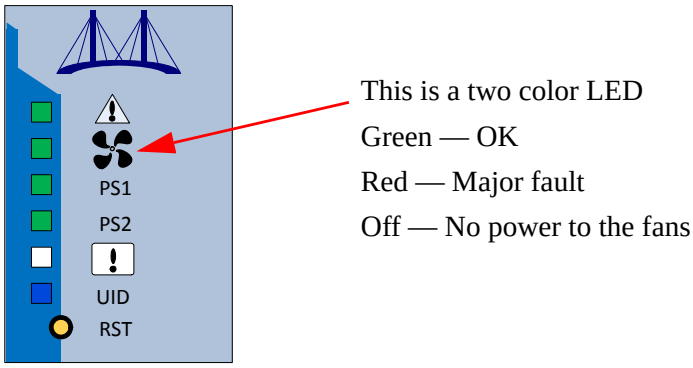
Table 3 - System Status LED Assignments

LED Configuration	STATUS/ System Health LED
Solid Green	OK – The system is up and running.
Flashing Green	The system is booting up. This assignment is valid on managed systems only.
Solid Yellow	To be implemented in a future SW release.
Solid Red	Major Error – Possible damage can result to the switch. Turn off immediately. e.g. bad firmware, can't boot, overheated
Off	Off – The system has no power.

2.1.1.2 Fan Status Indicators

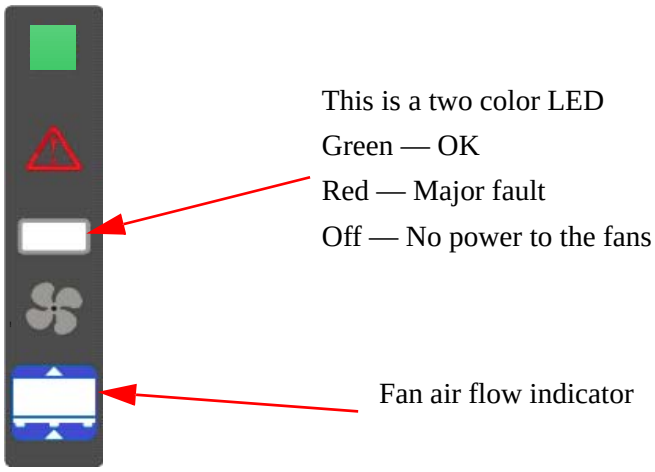
The indicator is located to the left of the connectors on the connector side panel.

Figure 5: Fan Status LED Connector Side



The LED indicator on the Fan Module is on the right side of the module.

Figure 6: Fan Status LED Power side



The following fan status conditions are possible:

Table 4 - Fan Status LED Assignments

LED Configuration	FAN LED
Solid Green	OK – All fans are up and running
Solid Red	Error – One or more fans is not operating properly. The system should be powered down and troubleshoot the fan module.
Off	Off – The fan unit is not receiving any power. Check that the fan unit is properly and completely inserted.

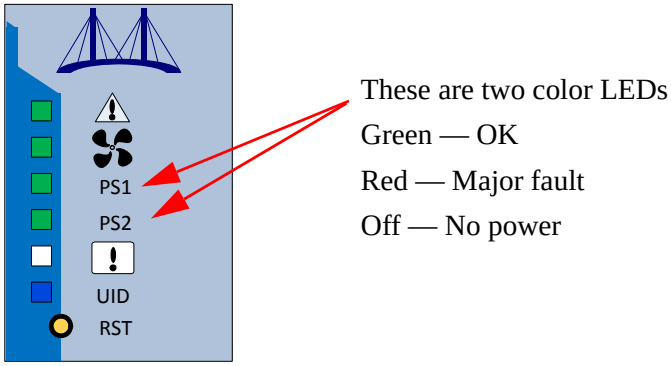
All fans must be operating while the power supply is plugged in.

If the switch shuts down due to over temperature, unplug the switch, wait 5 minutes and replug in the switch. For more information See “Troubleshooting” on page 51.

2.1.1.3 Power Supply Status Indicators

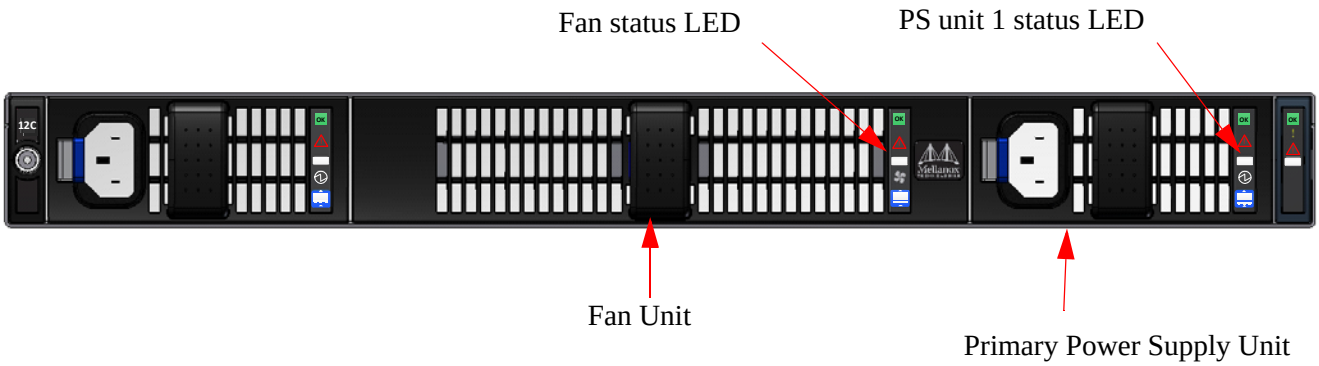
The indicator is located to the left of the connectors on the connector side panel.

Figure 7: Power Status LED Connector Side



This switch comes with two power supply units for full N+1 redundancy.

Figure 8: Power Side Panel



The primary power supply unit (PS1) is located on the right side of the power side panel, with PS2 on the left side. Each PS unit has a single 2 color LED on the right side of the PS unit, that indicates the internal status of the unit.

Figure 9: PS Unit Status LEDs

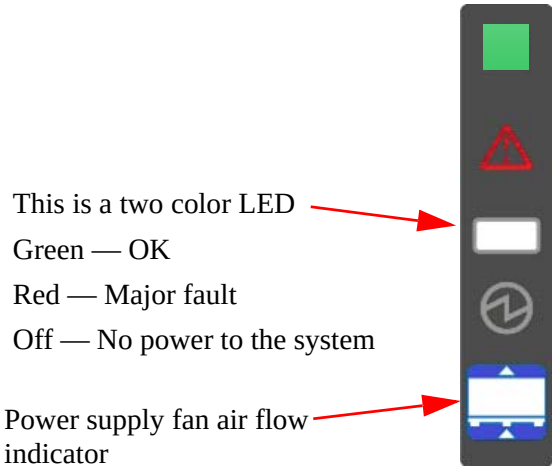
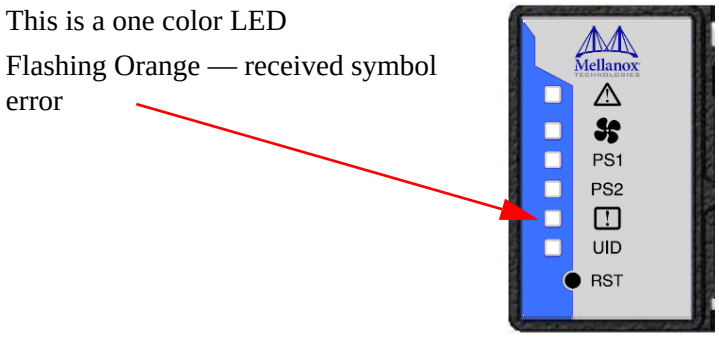


Table 5 - PS Unit Status LED Assignments

LED Color	Status
Solid Green	OK – The Power supply is delivering the correct voltage – 12VDC
Solid Red	Error – The PS unit is not operational
Off	Off – There is no power to the system (neither PS unit is receiving power). If one PS unit is showing green and the second PS unit is unplugged it will show a red indication.

2.1.1.4 Bad Port LED

Figure 10: Bad Port LED



The Bad Port indicator is located on the left side of the connector side panel of the unit. The following Bad Port conditions are possible.

Table 6 - Bad Port LED Assignments

LED Configuration	Description
Off	OK – No symbol errors have been received in last few seconds
Flashing Orange	Error – One or possibly more ports have just received a symbol error

This LED shows symbol errors. Possible causes for this are:

- Bad cable
- Bad connection
- Bad connector

This LED lights up when one or more ports is receiving a symbol error. The LED immediately goes off until the next symbol error is received.

2.1.1.5 UID LED Switch Identifier UID

The UID LED is a debug feature that lights a blue LED on the switch connector side panel for ease in finding a particular switch.

2.1.1.6 Port Connector LED Indicators

Above the uplink ports are LEDs, one for each port ▲. The following table shows the port status according to the LED indication.

Above the downlink ports are LEDs, 1 per port ▲. The following table shows the port status according to the LED indication.

Figure 11: Port LEDs

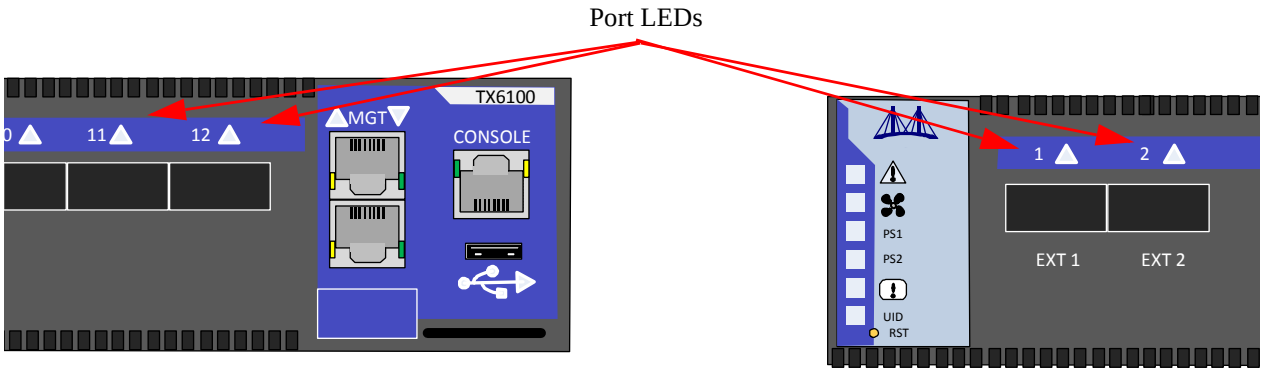


Table 7 - Connector Physical and Logical Link Assignments for IB

LED Status	LED Description
Off	No power to the port
Solid Green	Logical link up
Flashing Green	Data activity flashing speed is proportional to data transfer speed
Solid Orange	Physical link up
Flashing Orange	A problem with the physical link,

The LED indicator, corresponding to each data port, will light orange when the physical connection is established (that is, when the unit is powered on and a cable is plugged into the port with the other end of the connector plugged into a functioning port). When a logical connection is made the LED will change to green. When data is being transferred the light will blink green.

2.2 Air Flow

These switches can come with two air flow patterns. The two patterns are:

- Connector side inlet to power side outlet
- Power side inlet to connector side outlet

The air flow is specified in the product model number. See “Mellanox Part Numbering Legend” on page 9. On the PS unit and fan modules the air flow direction can be seen on the power side panel.

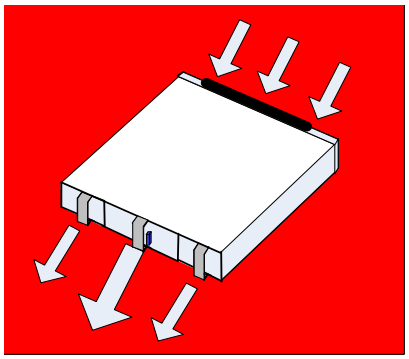
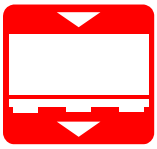
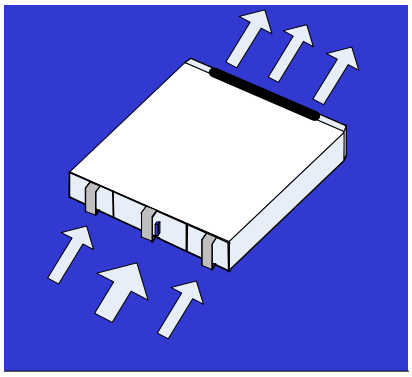
All PS units must have the same air flow as the fan module.

Figure 12: All Components Need the Same Air Flow

These air flow labels must be the same.
Red is connector side inlet to power side outlet

Blue is power side inlet to connector side outlet

Table 8 - Air Flow Direction

Direction	Label	OPN Designation	Description
		R	Connector side inlet to power side outlet
		F	Power side inlet to connector side outlet

2.3 QSFP Cable Power Budget Classification

AlMetroX downlink ports l SwitchX®-2are designed for active cables with a max power per module of 2W. Typical power per port is 1.5W

The MetroX uplink (long haul) ports are designed for active cables with a max power per module of 3.5W. Typical power per port is 2.5W.

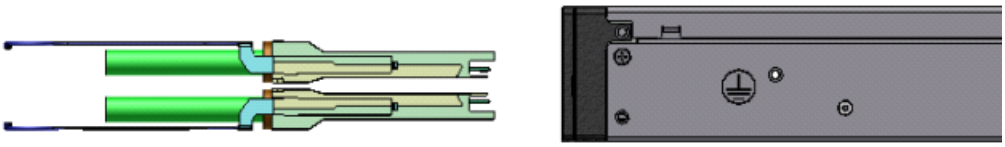
2.4 Interfaces

2.4.1 Port Connector Interfaces

The connector side of the switch has 12 QSFP ports. The 6 on the left side (numbered 1 -6) are long haul ports that require 3.5W max power per port and can drive the signal up to 10 km. The 6 ports on the right side (numbered 7 -12) are the downlink FDR ports. Four of the six downlink ports can be split to 4 X 10 Gb/s.

Figure 13: Port Numbering

Figure 14: Top and Bottom QSFP Port Orientation

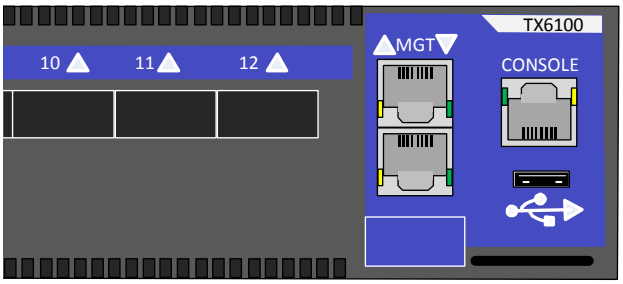


2.4.2 Management and Firmware Updating Interfaces

There are six interfaces to connect to the TX6100:

- 2 X 100M/1Gb Ethernet connectors labelled “MGT”
- 1 USB port that is labelled
  This interface can be used to update software or firmware.
- 1 connector that is labelled “CONSOLE”
  Use this connector to connect to the host PC.
- 1 reset button
- 1 I2C banana connector on the power supply side for FAE use only

Figure 15: Management Interfaces



2.4.2.1 RJ-45 Connector “CONSOLE”

The port labelled “CONSOLE” is for a local host connection to the management module. This is used the first time the switch is connected. A harness is included in the package to connect to a DB9 connection on a host PC. Connecting to a local host PC and following the instructions in the Installation Guide, “Configuring the Switch for the First Time”, must be done before any remote

management is available. For the Socket pinout see “RJ-45 CONSOLE and Ethernet interfaces” on page 59.

2.4.2.2 RJ-45 Ethernet Connector “MGT”

The Ethernet connection labelled “MGT” provides access for remote management. The switch can be connected to any Ethernet port.

Each Ethernet connector gets connected to Ethernet switches. These switches must be configured to 100M/1G auto-negotiation.

2.4.2.3 USB Connector

There is a single USB connector. This connector can be used to install software and or firmware upgrades using a memory device that has a USB connector. This connector is USB 2.0 compliant.

USB 1.0 is not supported.

2.4.2.4 I2C Connector

There is an I2C connector on the far left of the power side of the switch. **This interface is for Debug and Troubleshooting only.** This connector can be used to install firmware upgrades, should the firmware image be damaged and cannot be upgraded through a host PC or remotely. This interface is for support personnel and advanced users only.

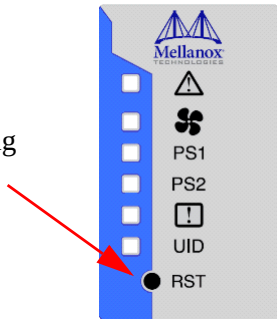
2.4.3 Reset Button

On the connector side panel under the system LEDs is a reset button. This reset button requires a tool to be pressed.

DO NOT use a sharp pointed object such as needle or push pin for pressing the Reset button. Sharp objects can cause damage, use a flat object to push the reset button.

Figure 16: Reset Button

Press the reset button to reset the main and management CPUs and to delete the existing password.



This button resets both the CPU of the switch device and the CPU of the management module. It thereby resets all of the ports by bringing them down and powering them up when the button is pushed. A quick push of this button performs this reset. When the button is held down for 15 seconds the switch is reset and the password is deleted. You will then be able to enter without a password and make a new password for the user *"admin"*.

3 Installation

Installation and initialization of the switch platform are straightforward processes, requiring attention to the normal mechanical, power, and thermal precautions for rack-mounted equipment.

The managed switch platform requires initial configuration to operate as an InfiniBand switch. All internally managed switches come with an internal PPC based management board. This board allows for internally managing the switch through a host PC or remotely through the Ethernet.

3.1 Installation Safety Warnings

For Safety Warnings in French see Section E,“Avertissements de sécurité d’installation (French),” on page 61, for German see Section F,“Installation - Sicherheitshinweise (German),” on page 65, and for Spanish see Section G,“Advertencias de seguridad para la instalación (Spanish),” on page 69.

1. **Installation Instructions**

Read all installation instructions before connecting the equipment to the power source.

2. **Over-temperature**

This equipment should not be operated in an area with an ambient temperature exceeding the maximum recommended: 45°C (113°F). Moreover, to guarantee proper air flow, allow at least 8cm (3 inches) of clearance around the ventilation openings.

3. **Stacking the Chassis**

The chassis should not be stacked on any other equipment. If the chassis falls, it can cause bodily injury and equipment damage.

4. **Redundant Power Supply Connection - Electrical Hazard**

This product includes a blank cover over the space for the redundant power supply. Do not operate the product if the blank cover is not securely fastened or if it is removed.

5. **During Lightning - Electrical Hazard**

During periods of lightning activity, do not work on the equipment or connect or disconnect cables.

6. Copper Cable Connecting/Disconnecting

Copper cables are heavy and not flexible, as such they should be carefully attached to or detached from the connectors. Refer to the cable manufacturer for special warnings and instructions.

7. Rack Mounting and Servicing

When this product is mounted or serviced in a rack, special precautions must be taken to ensure that the system remains stable. In general you should fill the rack with equipment starting from the bottom to the top.

8. Equipment Installation

This equipment should be installed, replaced, or serviced only by trained and qualified personnel.

9. Equipment Disposal

Disposal of this equipment should be in accordance to all national laws and regulations.

10. Local and National Electrical Codes

This equipment should be installed in compliance with local and national electrical codes.

11. Hazardous Radiation Exposure

Caution – Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.

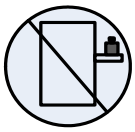
CLASS 1 LASER PRODUCT and reference to the most recent laser standards:
IEC 60 825-1:1993 + A1:1997 + A2:2001 and EN 60825-1:1994+A1:1996+ A2:2001

12. UL Approved AC Power Cords

For North American power connection, select a power supply cord that is UL Listed and CSA Certified
3 - conductor, [18 AWG], terminated in a molded on plug cap rated at 125 V, [15 A], with a minimum length of 1.5m [six feet] but no longer than 4.5m

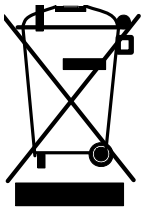
For European connection, select a power supply cord that is internationally harmonized and marked “<HAR>”,
3 - conductor, minimum 0,75 mm2 wire, rated at 300 V, with a PVC insulated jacket. The cord must have a molded on plug cap rated 250 V, 10 A.

13. Do Not Use the Switch as a Shelf or Work Space



Caution: Slide/rail mounted equipment is not to be used as a shelf or a work space.

14. WEEE Directive



According to the WEEE Directive 2002/96/EC, all waste electrical and electronic equipment (EEE) should be collected separately and not disposed of with regular household waste.

Dispose of this product and all of its parts in a responsible and environmentally friendly way.

The switch platform can be rack mounted and is designed for installation in a standard 19” rack. The power side of the switch includes a hot-swap power supply module, a blank cover for an optional second PS unit for redundancy, and a hot-swap fan tray. There are two possible air flow directions. Be sure that the switch air flow direction is compatible with your system, rack, and PS units. The connector side of the switch has the QSFP ports, system LEDs, and management connection ports.

The switch platform contains auto-sensing 100 - 240 VAC connections for all possible PS units.

The installer should use a rack capable of supporting the mechanical and environmental characteristics of a fully populated platform.

The rack mounting holes conform to the EIA-310 standard for 19-inch racks. Take precautions to guarantee proper ventilation in order to maintain good airflow at ambient temperature. Cable routing in particular should not impede the air exhaust from the chassis.

3.1.1 Installation Kits

There are two Installation kit options. One long and one short. Both the long and the short switches can be mounted using the long rail kit.

Table 9 - Installation Kit According to Rack Size

Kit OPN	Rack Size
MSX60-BKIT	40-60 cm deep
MSX60-SKIT	60-80 cm deep

3.2 Package Contents

Before you install your new TX6100switch, unpack the system and check to make sure that all the parts have been sent, check this against the parts list below. Check the parts for visible damage that may have occurred during shipping.

The switch comes packed with the following items:

- 1 X – switch
- 1 X – installation kit
- 2 X – power cable one for each PS unit – Type C13-C14
  - A single power cord for each power supply unit can be ordered at no extra charge
- 1 X – Harness
  - HAR000028 – Harness RS232 2M cable – DB9 to RJ-45switches
- 1 X – Quick Start Guide
- 1 X – China RoHS statement

If anything is damaged or missing, contact your customer representative immediately. For customer support go to:
www.mellanox.com =>Support => Customer Support Portal Login

3.3 Mechanical Installation

Tools and Customer Supplied Parts:

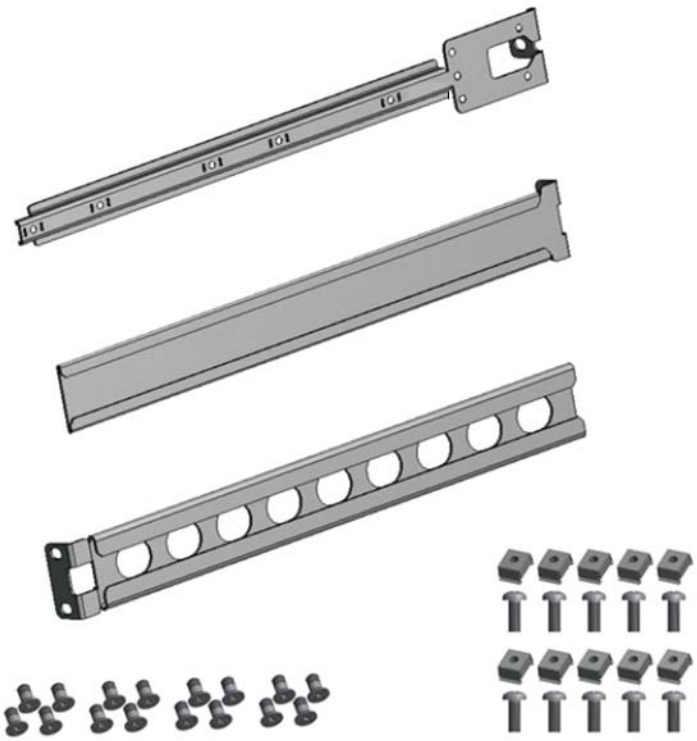
- Phillips Screwdrivers #1 and #2
- ESD strap
- ESD mat
- Grounding screw
- Grounding wire sufficient to reach a valid ground.

For racks from 60cm to 80cm deep either use the standard depth switches with the long rail kit or the short switches with the long rail kit.

Parts included in the rail kit:

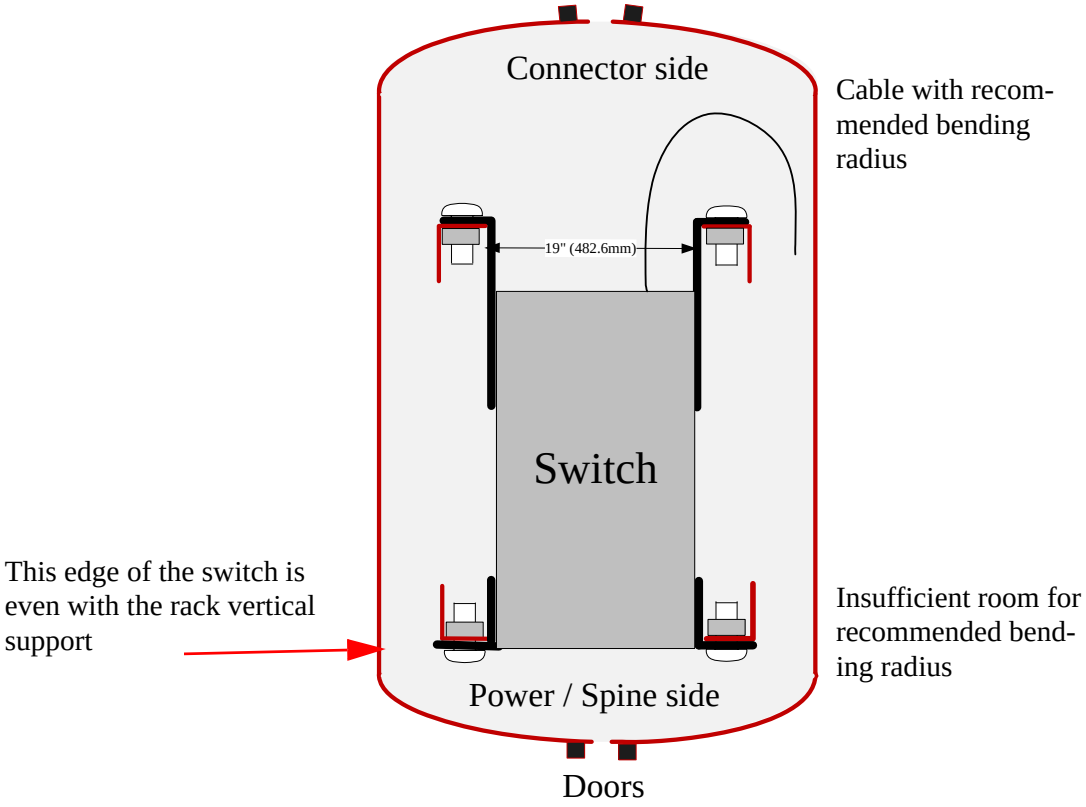
- 2 rails
- 2 rail slides
- 2 switch slides
- 16 recessed flat head screws You will have extras!
- 10 caged nuts
- 10 pan head screws M6

Figure 17: Rack Rail Kit Parts



1. Place the ESD mat on the floor where you will be working and put on the ESD strap. Make sure the ESD strap is touching your skin and that the other end is connected to a verified ground.
2. Choose which side of the switch you want even with the rack vertical support. Either the side with the power supply units or the side with the QSFP connectors can be even with one of the vertical rack supports.

Figure 18: Placement of Switch in Rack

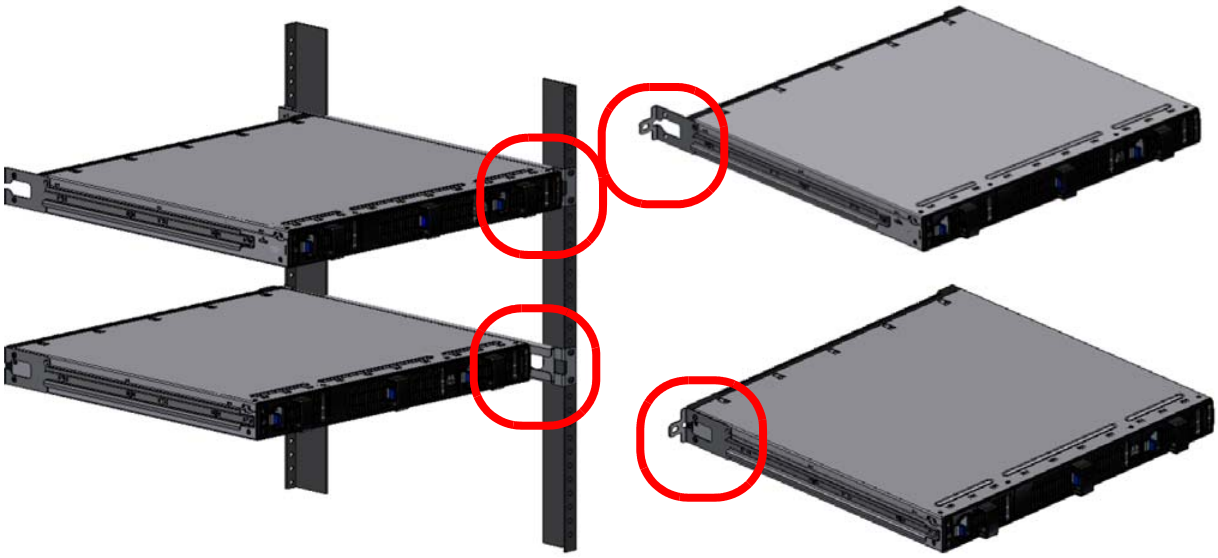

Connector side
Cable with recommended bending radius
19" (482.6mm)
Switch
This edge of the switch is even with the rack vertical support
Insufficient room for recommended bending radius
Power / Spine side
Doors

Things to consider before choosing where to mount the rails and rail slides.

The distance between the rack and the door can be as little as 4 cm on one side of the rack and as much as 18 cm on the other side of the rack. Keep in mind that there can be as many as cables connected to the switch.

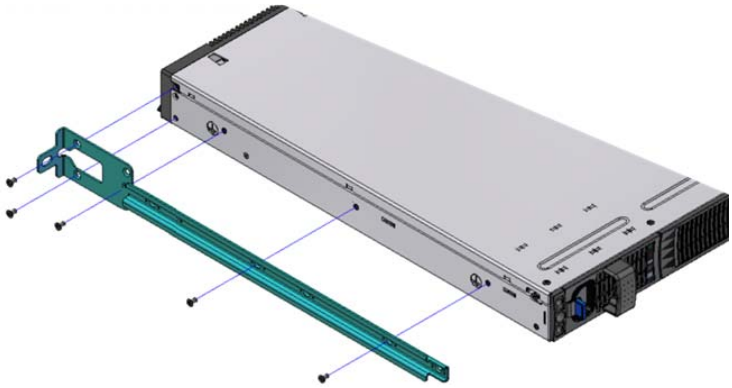
- Do you want the connector side recessed in the rack to allow for a larger cable bending radius? It is possible to recess the connector side by 5cm by optional placement of the switch rails. See Figure 19,“Mounting Options”.
- Will the connector side be recessed past other equipment in the rack and will this be problematic?
- The installation kit allows for a 2” recess of the switch past the vertical support.

Figure 19: Mounting Options



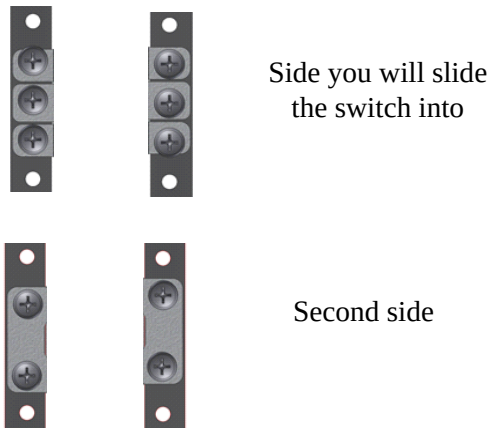
3. Decide which mounting option you want to use.
4. Screw the switch slides onto the switch. Use 5 flat head screws for short switches and 7 screws for standard depth switches, to connect each switch slide.

Figure 20: Screwing on the Rail



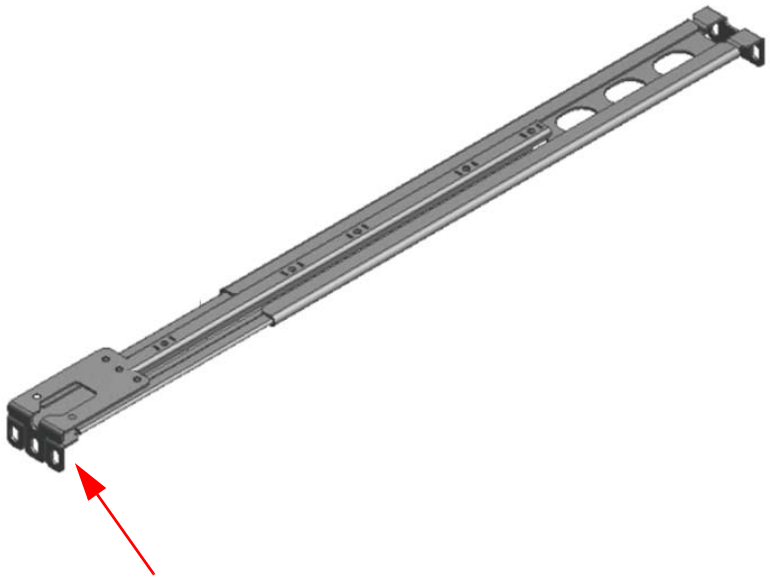
5 screws per side are needed for the short switch.
7 screws per side are needed for the standard switch.
There are 16 screws in the kit; you will have left over screws.

Figure 21: Inserting the Caged Nuts



5. Clip 6 caged nuts into the holes in the rack on the side of the rack you will be sliding the switch into. Check that both sides of the switch, power side and connector side, are at the same level in the rack.
6. Clip 4 more caged nuts into the holes on the opposite side of the rack. Check that both sides of the switch, left and right, are the same level in the rack.
7. Slide the rail into the rail slide.
8. Using two of the bolts for each corner install the rails and rail slides in the rack. Do not tighten the bolts yet.

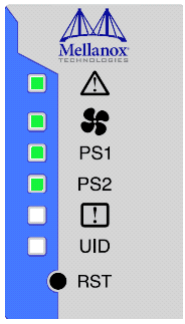
Figure 22: Slide the Rail into the Rail Slide



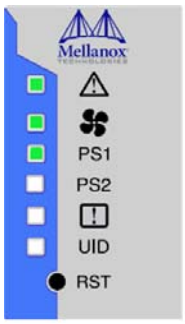
This side of the rail kit goes on the side of the rack you will slide the switch into. This is the same side of the switch that will be next to the vertical support.

9. Slide the switch into the rails.
10. Tighten the bolts to 9.2 Nm or 81.5 pound inches.
11. Put the switch into place and screw the bolts into the nuts. Tighten the bolts to 9.2 Nm or 81.5 pound inches.
12. Ground the switch.
13. Plug in the power cables.
14. Check the Status LEDs and confirm that all of the LEDs show status lights consistent with normal operation.

Figure 23: Status LEDs 5 Minutes After Power On



Switch with 2 PSUs



Switch with 1 PSU

Warning: Any yellow or red status LEDs are cause for concern and must be dealt with immediately.
It can take up to 5 minutes to boot up, during which time the status LED may indicate red.

15. You can start connecting all of the cables to the switch.

3.4 Grounding the Switch

Check to determine if your local or national electrical codes require an external ground to all IT components. If so, connect a ground wire to one of the casing screws and connect the other end to a valid ground. If you choose to not use the ground screw, make sure that the rack is properly grounded and that there is a valid ground connection between the chassis of the switch and the rack. Test the ground using an Ohm meter.

Some national and/or local codes may require IT components to be bonded and externally grounded (not including the power cord ground). You must follow all national and local codes when installing this equipment.

3.5 Power Connections and Initial Power On

The switch platform ships with two power supply units. Each supply has a separate AC receptacle. The input voltage is auto-adjusting for 100 - 240VAC, 50-60Hz power connections. The

power cords should be standard 3-wire AC power cords including a safety ground and rated for 15A or higher.

Caution: The switch platform will automatically power on when AC power is applied. There is no power switch. Check all boards, power supplies, and fan tray modules for proper insertion before plugging in a power cable.

Caution: After inserting a power cable and confirming the green system status LED light is on; make sure that the Fan Status indicator shows green.

If the fan status indicator is not green then unplug the power connection and check that the fan module is inserted properly and that the mating connector of the fan unit is free of any dirt and/or obstacles.

Caution: When turning off the switch, make sure ALL Connector LEDS are off to ensure a powered down status.

Do not hot swap the power supply if your switch has only one power supply. You must power down the system to replace the power supply unit when there is only one PS unit in the switch.

Figure 24: Two Power Inlets - Electric Caution Notifications

CAUTION

Risk of electric shock and energy hazard. The two PS units are independent.

Disconnect all power supplies to ensure a powered down state inside of the switch platform.

ACHTUNG

Gafahr des elektrischen Schocks. Entferrnen des Netzsteckers elnes Netz-teils spannungsfrei. Um alle Einhieten spannungs-frei zu machen sind die Netzstecker aller Netzteile zu entfernen

ATTENTION

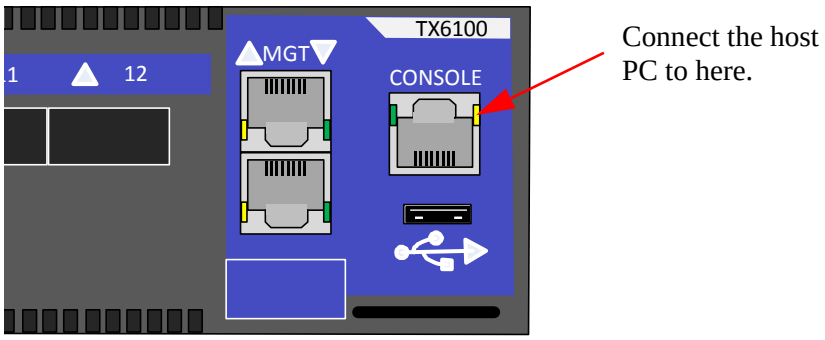
Risque de choc et de danger e’lectriques. Le de’branch-ment d’une seule alimentation stabilise’e ne de’branch uniquement qu’un module “Alimentation Stabilise’e”. Pour isoler completement le module en cause, Il faut de’brancher toutes les alimen-tations stabilise’es.

3.6 Configuring the Switch the First Time

The procedures described in this chapter assume that you have already installed and powered-on your switch according to the instructions in this document.

Step 1. Connect the host PC to the Console (RJ-45) port of the switch system using the supplied cable. The Console ports for systems are shown below as examples.

Figure 25: Console Port



Make sure to connect to the Console RJ-45 port of the switch and not to the (Ethernet) MGT port.

No remote IP connection is available at this stage.

Step 2. Configure a serial terminal program (for example, HyperTerminal, minicom, or Tera Term) on your host PC with the settings described in Table 10.

Table 10 - Serial Terminal Program Configuration

Parameter	Setting
Baud Rate	9600
Data bits	8
Stop bits	1
Parity	None
Flow Control	None

Step 3. Login (from a serial terminal program) as *admin* and use *admin* as password. This starts the Mellanox configuration wizard.

Step 4. Go through the Mellanox configuration wizard. Table 11 shows an example of a wizard session.

Table 11 - Configuration Wizard Session - IP Configuration by DHCP (Sheet 1 of 2)

Wizard Session Display (Example)	Comments
Mellanox configuration wizard Do you want to use the wizard for initial configuration? yes	You must perform this configuration the first time you operate the switch or after resetting the switch. Type 'y' and then press <Enter>.
Step1: Hostname? [switch-1]	If you wish to accept the default hostname, then press <Enter>. Otherwise, type a different hostname and press <Enter>.
Step 2: Use DHCP on mgmt0 interface? [no]	Perform this step to obtain an IP address for the switch. (eth0 is the management port of the switch.) If you wish the DHCP server to assign the IP address, type 'yes' and press <Enter>. If you type 'no' (no DHCP), then you will be asked whether you wish to use the 'zeroconf' configuration or not. If you enter 'yes' (yes Zeroconf), the session will continue as shown in Table 12. If you enter 'no' (no Zeroconf), then you need to enter a *static* IP, and the session will continue as shown in Table 13.
Step 3: Enable IPv6? [yes] yes	The management interface will be able to use IPv6 addresses.
Step 4: Enable IPv6 autoconfig (SLAAC) on mgmt0 interface? [no] no	This turns on autoconfiguration of the IPv6 addresses. This is unsuitable for DHCPv6.

Table 11 - Configuration Wizard Session - IP Configuration by DHCP (Sheet 2 of 2)

Wizard Session Display (Example)	Comments
Step 5: Admin password (Press <Enter> to leave unchanged)? <new_password> Step 6: Confirm admin password? <new_password>	To avoid illegal access to the machine, please type a password and then press <Enter>. Then confirm the password by re-entering it. Note that password characters are *not* printed.
You have entered the following information: 1. Hostname: <switch name> 2. Use DHCP on mgmt0 interface: yes 3. Enable IPv6: yes 4. Enable IPv6 autoconfig (SLAAC) on mgmt0 interface: no 5. Admin password (Enter to leave unchanged): (CHANGED) To change an answer, enter the step number to return to. Otherwise hit <enter> to save changes and exit. Choice: <Enter> Configuration changes saved. To return to the wizard from the CLI, enter the "configuration jump-start" command from configuration mode. Launching CLI... <switch name> [>	The wizard displays a summary of your choices and then asks you to confirm the choices or to re-edit them. Either press <Enter> to save changes and exit, or enter the configuration step number that you wish to return to. Note: To run the command "configuration jump-start" you must be in Config mode.

Table 12 - Configuration Wizard Session - IP Zeroconf Configuration

Wizard Session Display - IP Zeroconf Configuration (Example)
Mellanox configuration wizard Do you want to use the wizard for initial configuration? y Step 1: Hostname? [switch-112126] Step 2: Use DHCP on mgmt0 interface? [yes] no Step 3: Use zeroconf on mgmt0 interface? [no] yes Step 4: Default gateway? [For example:192.168.10.1] Step 5: Primary DNS server? Step 6: Domain name? Step 7: Enable IPv6? [yes] yes Step 8: Enable IPv6 autoconfig (SLAAC) on mgmt0 interface? [no] no Step 9: Admin password (Enter to leave unchanged)? Step 9: Confirm admin password? (Enter to leave unchanged)? You have entered the following information: 1. Hostname: switch-112126 2. Use DHCP on mgmt0 interface: no 3. Use zeroconf on mgmt0 interface? [no] yes 4. Default gateway: 192.168.10.1 5. Primary DNS server: 6. Domain name: 7. Enable IPv6: yes 8. Enable IPv6 autoconfig (SLAAC) on mgmt0 interface: no 9. Admin password (Enter to leave unchanged): (unchanged) To change an answer, enter the step number to return to. Otherwise hit <enter> to save changes and exit. Choice: Configuration changes saved. To return to the wizard from the CLI, enter the "configuration jump-start" command from configure mode. Launching CLI... switch-1 >

Table 13 - Configuration Wizard Session - Static IP Configuration

Wizard Session Display - Static IP Configuration (Example)
Mellanox configuration wizard Do you want to use the wizard for initial configuration? y Step 1: Hostname? [switch-112126] Step 2: Use DHCP on mgmt0 interface? [yes] n Step 3: Use zeroconf on mgmt0 interface? [no] Step 4: Primary IP address? [for example 192.168.10.4] Mask length may not be zero if address is not zero (interface eth0) Step 5: Netmask? [0.0.0.0] 255.255.255.0 Step 6: Default gateway? [for example 192.168.10.1] Step 7: Primary DNS server? Step 8: Domain name? Step 9: Enable IPv6? [yes] yes Step 10: Enable IPv6 autoconfig (SLAAC) on mgmt0 interface? [no] no Step 11: Admin password (Enter to leave unchanged)? You have entered the following information: 1. Hostname: switch-112126 2. Use DHCP on mgmt0 interface: no 3. Use zeroconf on mgmt0 interface: no 4. Primary IP address: 192.168.10.4 5. Netmask: 255.255.255.0 6. Default gateway: 192.168.10.1 7. Primary DNS server: 8. Domain name: 9. Enable IPv6: yes 10. Enable IPv6 autoconfig (SLAAC) on mgmt0 interface: no 11. Admin password (Enter to leave unchanged): (unchanged) To change an answer, enter the step number to return to. Otherwise hit <enter> to save changes and exit. Choice: Configuration changes saved. To return to the wizard from the CLI, enter the "configuration jump-start" command from configure mode. Launching CLI... switch-1 >

Step 5. Before attempting a remote (for example, SSH) connection to the switch, check the mgmt0 interface configuration. Specifically, verify the existence of an IP address. To check the current mgmt0 configuration, enter the following commands:

```
sx-43 [standalone: master] > enable

sx-43 [standalone: master] # show interfaces mgmt0
```

The following is an example of the output:

```
Interface mgmt0 state
   Admin up:           yes
   Link up:            yes
   IP address:         192.168.10.43
   Netmask:            255.255.255.0
   Speed:              1000Mb/s (auto)
   Duplex:             full (auto)
   Interface type:     ethernet
   Interface source:   physical
   MTU:                1500
   HW address:         00:02:C9:11:2A:AE
   Comment:

RX bytes:          1343502058          TX bytes:     313920869
RX packets:         17589211           TX packets:      992717
RX mcast packets:  0                   TX discards:    0
RX discards:        0                  TX errors:      0
RX errors:          0                  TX overruns:    0
RX overruns:        0                  TX carrier:     0
RX frame:           0                  TX collisions:  0
                                          TX queue len:   1000
```

3.7 Rerunning the Wizard

If you want to rerun the wizard run the following commands:

```
sx-43 [standalone: master] > enable
sx-43 [standalone: master]# configure terminal
sx-43 [standalone: master]# configuration jump-start
```

3.8 Connecting to the Switch Platform

3.8.1 Starting a Remote Connection to the Switch

There are two ways to access the management CPU:

- Via the Ethernet connector for remote access:
  - SSH
  - Telnet
  - Web
  - SNMP
  - XML
- Via KVM connections locally

For details on the SNMP commands and MIBs supported refer to the MLNX-OS™ Software Command Reference Guide.

3.9 Starting an SSH Connection to the Switch (CLI)

Step 1. Set up an Ethernet connection between the switch and a local network machine (“the remote machine” henceforth) using a standard RJ-45 connector.

Step 2. Connect to the remote machine (*rem_mach1* is used as an example).

Step 3. Start a remote shell to the switch using the following command using <switch_IP_address> is the IP address of the switch.

```
rem_mach1 >  ssh -l <username> <switch ip address>


Mellanox MLNX-OS Switch Management


Password:
Last login: Thu Apr 28 11:24:13 2011 from 192.168.10.1


    Mellanox Switch


sx-43 [standalone: master] >
```

Step 4. You can enter any supported command now.

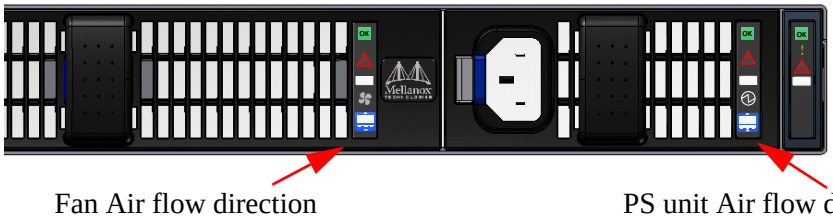
4 Extracting and Inserting FRUs

4.1 Extracting and Inserting the Power Supply Unit

With both power supplies installed in the redundant configuration, either PS unit may be extracted without bringing down the system.

Make sure that the PS unit that you are NOT replacing is showing all green, for both the PS unit and status indicators.

Figure 26: Fan and PS unit Air Flow Direction



Power supply units have directional air flows similar to the fan module. The Fan module airflow must coincide with the airflow of all of the PS units. If the PS unit airflow direction is different from the fan module airflow direction the switch internal temperature will be affected.

Figure 27: Power Supply Unit Extraction

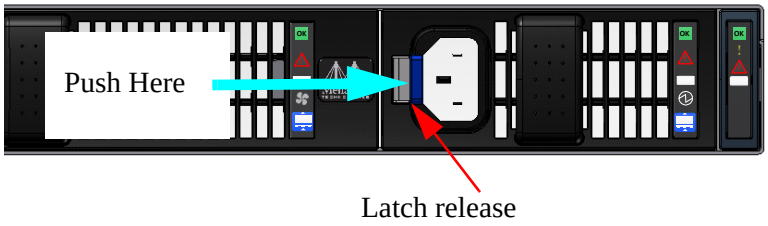
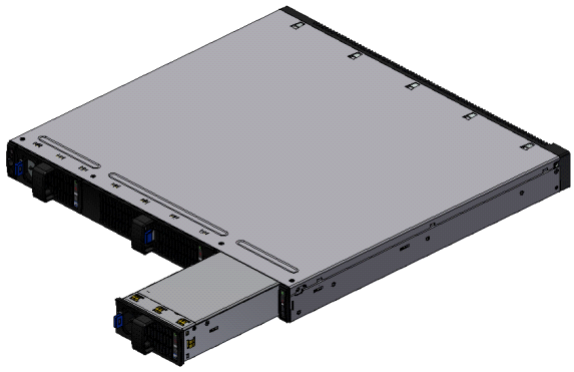


Figure 28: PS Unit Pulled Out



To extract a PS unit:

1. Remove the power cord from the power supply unit.
2. Grasping the handle with your right hand, push the latch release with your thumb while pulling the handle outward. As the PS unit unseats, the PS unit status indicators will turn off.
3. Remove the PS unit.

To insert a PS unit:

1. Make sure the mating connector of the new unit is free of any dirt and/or obstacles.

Do not attempt to insert a PS unit with a power cord connected to it.

2. Insert the PS unit by sliding it into the opening until a slight resistance is felt.
3. Continue pressing the PS unit until it seats completely. The latch will snap into place confirming the proper installation.
4. Insert the power cord into the supply connector.
5. Insert the other end of the power cord into an outlet of the correct voltage.

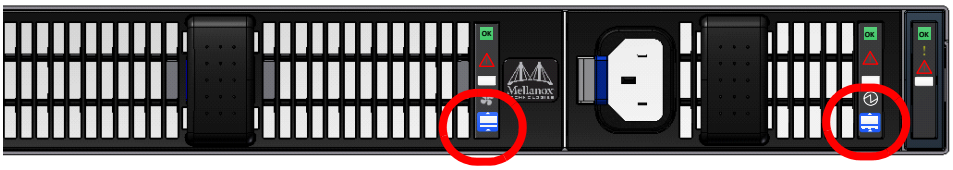
The green PS unit indicator should light. If not, repeat the whole procedure to extract the PS unit and re-insert it.

4.2 Extracting and Inserting the Fan Unit

This switch can operate indefinitely with less than a full compliment of fans in the fan module inoperable so long as the ambient temperature is below 45° Celsius.

Operation without a fan unit should not exceed two minutes.
During fan hot-swap, if the LED indicator is OFF then the fan unit is disconnected.

Figure 29: Air Flow Labels

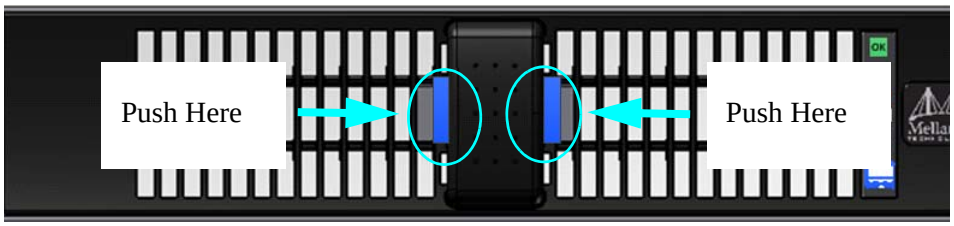


These air flow labels must be the same

To extract a Fan Unit

1. Using two fingers, push both latch releases towards each other simultaneously while pulling the fan module out of the switch. As the fan unseats, the fan status indicator will turn off.
2. Remove the fan unit.

Figure 30: Fan Module Latches



These two latches must be pushed towards each other at the same time while the module is pulled out.

To insert a FAN Unit:

1. Make sure the mating connector of the new unit is free of any dirt and/or obstacles.
2. Insert the fan unit by sliding it into the opening until slight resistance is felt. Continue pressing the fan unit until it seats completely.

The green fan status indicator should light. If not, extract the fan unit and reinsert it. After two unsuccessful attempts to install the fan unit, power off the switch before attempting any system debug.

5 Cabling

5.1 Supported Approved Cables

For a list of approved cables for this switch see
http://www.mellanox.com/related-docs/user_manuals/Mellanox_approved_cables.pdf

5.2 Splitting the Data Stream Using Breakout (Fanout) Cables

Specific ports can be split by using a QSFP 1X4 breakout cable to split one 40 GbE port into 4 lanes (4 SFP+ connectors 10GbE each). These 4 lanes then go, one lane to each of the 4 SFP+ connectors.

Figure 31: Breakout or Fanout Cable

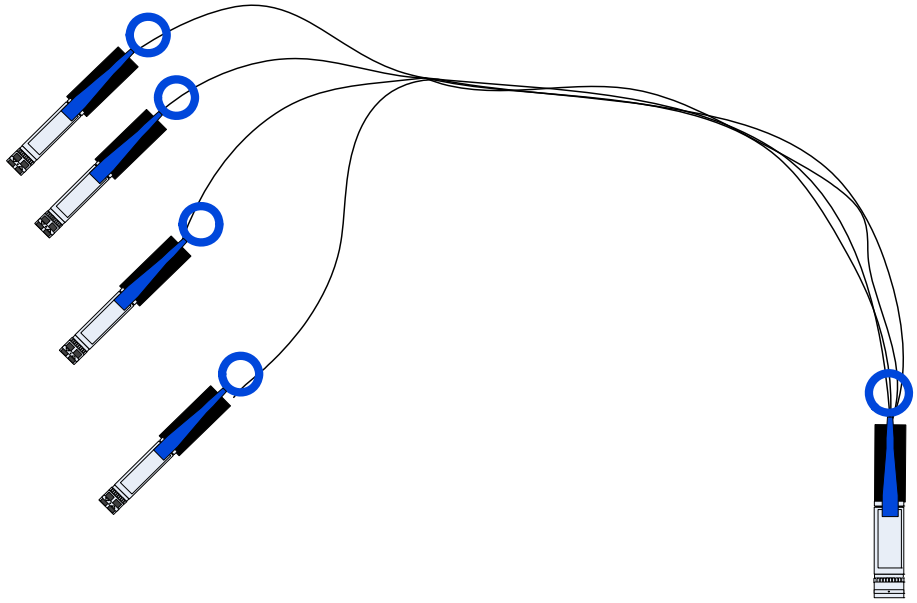


Figure 32: Port Splitting Options

This port can be split into 4 10Gb/s SFP+

The maximum 10 Gb/s Ethernet ports configurable with this switch is 24.

5.3 Cable Installation

56Gb/s and 40Gb/s are only guaranteed to work with approved Mellanox Cables.

All cables can be inserted or removed with the unit powered on. To insert a cable, press the connector into the port receptacle until the connector is firmly seated. The LED indicator, corresponding to each data port, will light when the physical connection is established (that is, when the unit is powered on and a cable is plugged into the port with the other end of the connector plugged into a functioning port). After plugging in a cable, lock the connector using the latching mechanism particular to the cable vendor. When a logical connection is made the LED will change to green. When data is being transferred the light will blink green.

To remove, disengage the locks and slowly pull the connector away from the port receptacle. The LED indicator for that port will turn off when the cable is unseated.

Care should be taken not to impede the air flow through the ventilation holes next to the connector ports. Cable lengths should be used which allow for routing horizontally around to the side of the chassis before bending upward or downward in the rack.

6 Switch Shut Down Procedure

To shut down the switch run the command:

```
Reload halt [noconfirm]
```

The switch cannot be restarted remotely!
To restart the switch you must physically go to the switch and unplug and plug in the power cord.

7 Disassembly of the Switch from the Rack

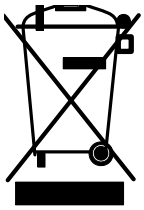
To disassemble the switch from the rack:

1. Unplug and remove all connectors.
2. Unplug all power cords.
3. Remove the ground wire.
4. Unscrew the 2 center bolts from the side of the switch with the bracket.

Support the weight of the switch when you remove the screws so that the switch does not fall.

5. Slide the switch from the rack.
6. Remove the rail slides from the rack.
7. Remove the ten caged nuts.

7.1 Disposal



According to the WEEE Directive 2002/96/EC, all waste electrical and electronic equipment (EEE) should be collected separately and not disposed of with regular household waste.

Dispose of this product and all of its parts in a responsible and environmentally friendly way.

Follow the instructions found in the Mellanox Web site at mellanox.com for proper instructions to disassemble and dispose of the Switch according to the WEEE directive.

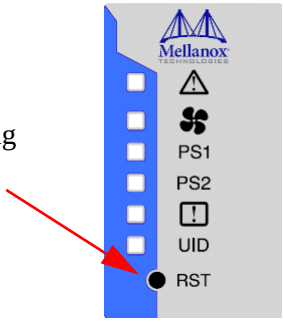
8 Resetting the Switch

On the connector side panel under the system LEDs is a reset button. This reset button requires a tool to be pressed.

DO NOT use a sharp pointed object such as needle or push pin for pressing the Reset button. Sharp objects can cause damage, use a flat object to push the reset button.

Figure 33: Reset Button

Press the reset button to reset the main and management CPUs and to delete the existing password.



This button resets both the CPU of the switch device and the CPU of the management module. It thereby resets all of the ports by bringing them down and powering them up when the button is pushed. A quick push of this button performs this reset. When the button is held down for 15 seconds the switch is reset and the password is deleted. You will then be able to enter without a password and make a new password for the user *"admin"*.

9 Management and Tools Overview

Using this switch as an InfiniBand switch you will need the MLNX-OS package or Mellanox UFM™ to update firmware for this switch. The MLNX-OS package can be downloaded from:

http://www.mellanox.com. => Products > Management Software > MLNX-OS.

The switch can be managed either remotely, or Out-of-Band using MLNX-OS.

9.1 Switch Management Using the MLNX-OS™ Software

The TX6100 switches come standard with a management software module for chassis management called Mellanox Operating System (MLNX-OS). MLNX-OS is installed on all SwitchX®-2 based managed switch systems. MLNX-OS includes a CLI, WebUI, SNMP and chassis management software and IB management software (OpenSM).

The Ethernet ports for remote management connect to Ethernet switches. These switches must be configured to 100M/1G auto-negotiation.

The IB Subnet Manager running on the TX6100 switches supports up to 648 nodes. If the fabric includes more than 648 nodes, you may need to purchase Mellanox's Unified Fabric Manager™ (UFM™) software package.

The managed switch system includes the following software components:

- Embedded OS
- Chassis manager and system BIST
- SNMP agent, 3rd party tool integration
- GUI
- Subnet manager
- Remote logging
- SSH/telnet
- Secured access in-band and out-band
- IPv4/IPv6 network stack

9.2 Switch Management

The chassis management includes the following features:

- Upgrading SwitchX®-2 firmware
- Upgrading software
- Monitoring of:
  - AC power to the PSUs
  - DC power out from the PSUs
  - Board temperature
  - Fan module status

- Chassis failures

- Querying for switch serial numbers and their revisions, software version and SwitchX®-2 FW version

9.2.1 InfiniBand Subnet Manager

The InfiniBand Subnet Manager (SM) is a centralized entity running in the switch. It discovers and configures all the InfiniBand fabric devices to enable traffic flow between those devices. The SM applies network traffic related configurations such as QoS, routing, partitioning to the fabric devices.

You can view and configure the Subnet Parameters (SM) via the CLI/WebUI. Each subnet needs one subnet manager to discover, activate and manage the subnet.

Each network requires a Subnet Manager to be running in either the switch itself (switch based) or on one of the nodes which is connected to the fabric (host based).

No more than two subnet managers are recommended for any single fabric.

9.3 Fabric Inspector (Diagnostics)

Fabric Inspector is a plug & play software for fee within MLNX-OS™ displaying and filtering all identified systems and nodes within the fabric.

Fabric Inspector includes a complete set of tools for fabric wide diagnostics to check node-node and node-switch connectivity and to verify routes within the fabric.

Advanced filtering allows creating filtering rules on a system wide basis, between nodes or port connections based on traffic patterns and user assigned system names (GUIDs).

9.3.1 Upgrading Software

Software and firmware updates are available from the Mellanox Support website. Copy the update to a known location on a Remote server within the user's LAN.

Use the CLI or the GUI in order to perform Software upgrades. For further information please refer to the MLNX-OS User Manual.

Be sure to read and follow all of the instructions regarding the updating of the software on your switch system.

10 Troubleshooting

As soon as a switch is plugged in make sure that the green power LEDs on the PS units are on.

Status LED and or Status Health LED

If either of these two LEDs is **red** unplug the switch and call your Mellanox representative.

Power supply unit:

If the LED on the PS unit is not lit or is red, check that the power cable is plugged into a working outlet.

1. Check that the power cable has a voltage within the range of 100 - 240 volts AC.
2. Check that the air flow direction of the PS units are consistent with the Fan module air flow.
3. Remove and reinstall the power cable.
4. Remove and reinstall the PS unit.

The power LED for the switch shuts off:

1. Check that the there is adequate ventilation. Are the fan LEDs showing that the fans are all up and running?
2. Make sure that there is nothing blocking the front or rear of the chassis and that the fan modules and ventilation holes are not blocked (especially dust over the holes).
3. If you find dust blocking the holes it is recommended to clean the fan unit and remove the dust from the front and rear panels of the switch using a vacuum cleaner.

The green power LED for the fans does not come on:

1. Check that the Power LEDs are on.
2. Remove and reinstall the fan unit. Make sure the mating connector of the new unit is free of any dirt and/or obstacles. See Section 6, “Switch Shut Down Procedure,” on page 46.
3. Check that the mating connector pins are not bent.

Caution: Do not run the switch if the System Status LED for the Fans is Red!

The link LED for the connector does not come on:

1. Check that both ends of the cable are connected.
2. Check that the locks on the ends are secured.
3. Make sure that the latest firmware version is installed on all of the HCA cards and the switch.
4. If media adapters are used, check that the all connections are good, tight, and secure.

The activity LED does not come on:

When running IB check that the Subnet Manager has been started.

The switch is off:

1. Unplug the switch.
2. Wait 5 minutes.
3. Plug in the switch.

4. If the switch does not come on, check the power supplies.
5. If the switch comes on, Use the MLNX-OS™ management CLI to determine the cause of the Shutdown.
6. Check the temperature.
7. Check the Fan status.

The switch is not working and unresponsive:

1. Reset the switch.

If resetting the switch does not work:

2. Unplug the switch.
3. Wait 5 minutes.
4. Plug in the switch.
5. If the switch does not come on, check the power supplies.
6. If the switch comes on, use the MLNX-OS management CLI to determine the cause of the shutdown.

The last software update did not succeed:

1. Connect the RS232 connector (CONSOLE) to a laptop.
2. Push the reset button on the switch or management module.
3. You will have ~ 5 seconds to stop the U-Boot by pressing Control-B.
4. Choose the image to upload. Only use image 1 or image 2.

```
U-Boot 2009.01-mlnx1.4 (May 12 2010 - 14:08:15)


CPU:   AMCC PowerPC 460EX Rev. A at 1000 MHz (PLB=200, OPB=100,
       EBC=100 MHz)
       Security/Kasumi support
       Bootstrap Option H - Boot ROM Location I2C (Addr 0x52)
       Internal PCI arbiter disabled
       32 kB I-Cache 32 kB D-Cache
Board: Mellanox PPC460EX Board
FDEF:  No
I2C:   ready
DRAM:   2 GB (ECC enabled, 400 MHz, CL3)
FLASH: 16 MB
NAND:  1024 MiB
PCI:   Bus Dev VenId DevId Class Int
PCIE0: link is not up.
```

```
PCIE1: successfully set as root-complex
        01  00  15b3  bd34  0c06  00
Net:   ppc_4xx_eth0, ppc_4xx_eth1
Hit Ctrl+B to stop autoboot:  0


Mellanox MLNX-OS


Boot Menu:
  1. EFM_PPC_M460EX EFM_1.1.1000 2010-06-24 16:32:03 ppc
  2. EFM_PPC_M460EX EFM_1.1.1200  2010-06-25  18 :00:03 ppc
  3. U-Boot prompt
  Choice:
```

5. Select the image to boot.

Appendix A: Specification

Table 14 - TX6100 Specification Data

Physical				
Size/Weight	TX6100 (Standard)	(1U) 1.71” H x 16.85” W x24.75” D 43.6mm X 427.5mm X 628.9 mm	Weight: Short: Standard:	 8.01 kg 1 PS unit 8.75 kg 2 PS units 8.95 kg 1 PS unit 9.69 kg 2 PS units
Mounting	Mounting:	19” Rack mount		
SerDes Speeds / Connector Types	SerDes Speeds:	10, 20, 40, or 56 Gb/s per port	Connector Types:	QSFP Can use QSFP to SFP+ adapter modules
Air Flow/ Heat dissipation	Air Flow:	62 CFM	Heat dissipation: Maximum	641.7 BTUs/hr
Power and Environmental				
Input Voltage / Management CPU	Input Voltage:	100 - 240 VAC 50-60Hz	Management CPU:	PowerPC 460EX CPU
Power numbers	Power Consumption:	PS unit fan is always at 80%	Typ@Typ: 56Gb/s Active Cables: Passive cables:	 149.65 W 119 W
	Max@Max: 56Gb/s Active Cables: Passive cables:	 188.06 W 145.91 W	QSFP Power Level Typ:	Downlink / Uplink 2 / 4 1.5W / 2.5W
Cable power / Temperature	QSFP Power Level MAX:	Downlink / Uplink 2 / 4 2.0W / 3.5W	Temperature: Operating Non-operating	 0° to 45° Celsius -40° to 70° Celsius
Shock and Vibration/ Humidity	Shock and Vibration:	ETSI EN 300 019-2-2: 1999-09	Humidity: Operating	 5% - 95% non-condensing
Protocol Support				
Speed protocol \ QoS / Management	IB:	Auto-Negotiation of (56Gb/s, 40Gb/s, 10Gb/s, 1Gb/s)	Management:	Managed using MLNX-OS

Data Rate	Data Rate:	56Gb/s		
Regulatory Compliance				
Safety \ EMC (Emissions)	Safety:	US/Canada: cTUVus EU: IEC60950 International: CB Russia: GOST-R Argentina: S-mark DoC	EMC (Emissions):	USA: FCC, Class A Canada: ICES, Class A EU: EN55022, Class A EU: EN55024, Class A EU: EN61000-3-2, Class A EU: EN61000-3-3, Class A Japan: VCCI, Class A Australia / New-Zealand: AS/NZS CISPR 22 class A
Environmental / Acoustic	Environmental:	EU: IEC 60068-2-64: Random Vibration EU: IEC 60068-2-29: Shocks, Type I / II EU: IEC 60068-2-32: Fall Test	Acoustic:	ISO 7779 ETS 300 753 72 dBa
Scalability and Performance				
Switching Performance / Capacity	Switching Performance:	Simultaneous wire-speed any port to any port	Switching Capacity:	240 Gb/s long haul (uplink) 336 Gb/s down link
Reliability, Availability and Serviceability Features				
Hot swapability / Redundancy	Hot-Swappable: 1+1 Redundant:	Fan Module Power Supplies		

A.1 Approved Cables

For a list of all approved cables see:

http://www.mellanox.com/related-docs/user_manuals/Mellanox_approved_cables.pdf

A.2 EMC Certifications

The list of approved certifications per switch in different regions of the world is located on the Mellanox Website at:

http://www.mellanox.com/related-docs/user_manuals/Regulatory_and_Compliance_Guide.pdf

EMC statements are also in the Regulatory and Compliance Guide.

A.3 China CCC Warning Statement

China-CCC Warning statements

在维修的时候一定要断开所有电源 (English translation"disconnect all power sources before service")

For non tropical use:

安全说明和标记	汉文	"仅适用于非热带气候条件下安全使用。"
	藏文	《ཀཱཀཱཀཱ། ཇཀཱཀ ཀ ཇཀཀ ཀཀཀཀ ཀཀཀཀ ཅ། ཀཀཀཀཀ ཀཀཅ། ཀཀཀཀ ཀཀཀཀ ཀཀ ཀ། ཀཀཀཀ།》
	蒙古文	"ᠬᠦᠳᠠᠳᠬᠠᠯᠵᠠᠭᠤᠢ᠂ᠭᠠᠵᠠᠷ᠎ᠤᠨ᠎ᠭᠠᠭᠴᠠᠭᠠᠷ᠎ᠤᠨ᠎ᠲᠤᠰᠠᠯᠪᠠᠷᠢ᠎ᠶᠢᠨ᠎ᠳᠤᠤᠷᠠᠴᠢᠨ᠎ᠲᠤᠰᠠᠯᠵᠠᠭᠤᠢ᠎ᠶᠢᠨ᠎ᠲᠤᠯᠳ᠎ᠤᠭᠠ᠎ᠰᠠᠭᠤᠷᠢᠮᠳᠠᠯ᠎ᠤᠨ᠎ᠵᠢᠷᠤᠭ᠎ᠲᠠᠢ᠎ᠪᠠᠢᠭᠠᠭᠠᠷᠠᠢ᠃"
	壮文	Dan hab yungh youq gij dienheiq diuzgen mbouj dwg diegndat haenx ancienz sawjyungh.
	维文	غەيرى ئىسسىق بەلباغ ھاۋا كىلىماتى شارائىتىدىلا بىخەتەر ئىشلەتكىلى بولىدۇ

For altitude 2000 meter and below:

安全说明和标记	汉文	仅适用于海拔2000m以下地区安全使用。
	藏文	《2000m ཁ་ལ་ཨཏྨོསཕེར་ཡི་ཀློག་ཁཏོ་ ཐེ ཀུན་ཁཏོ་ ཐེ ཀ་ཨཏྨོསཕེར་ཐེ ཀ། ཨཏྨོསཕེར།》
	蒙古文	"ᠲᠤᠰᠠᠯᠴᠠᠬᠢ ᠬᠡᠯᠪᠡᠷᠢ᠎ᠶᠢᠨ᠎ᠳᠡᠭᠡᠭᠦᠷ᠎ᠦᠨ᠎ 2000 ᠮᠢᠲᠦᠷ ᠤᠨ᠎ᠳᠤᠤᠷ᠎ᠠᠴᠠ᠎ᠭᠠᠵᠠᠷ᠎ᠤᠨ᠎ᠲᠤᠰᠠᠯᠵᠠᠭᠤᠢ᠎ᠶᠢᠨ᠎ᠲᠤᠯᠳ᠎ᠤᠭᠠ᠎ᠰᠠᠭᠤᠷᠢᠮᠳᠠᠯ᠎ᠤᠨ᠎ᠵᠢᠷᠤᠭ᠎ᠲᠠᠢ᠎ᠪᠠᠢᠭᠠᠭᠠᠷᠠᠢ᠃"
	壮文	Dan hab yungh youq gij digih haijbaz 2000m doxroengz haenx ancienz sawjyungh.
	维文	دېڭىز يۈزىدىن 2000 مېتر تۆۋەن رايونلاردىلا بىخەتەر ئىشلەتكىلى بولىدۇ

Warning for Class A:

声 明

此为 A 级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

English translation of above statement

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Appendix B: QSFP Interface

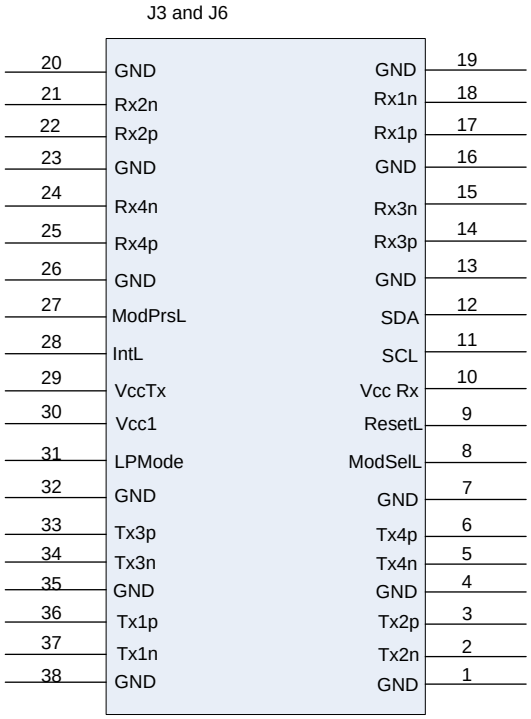
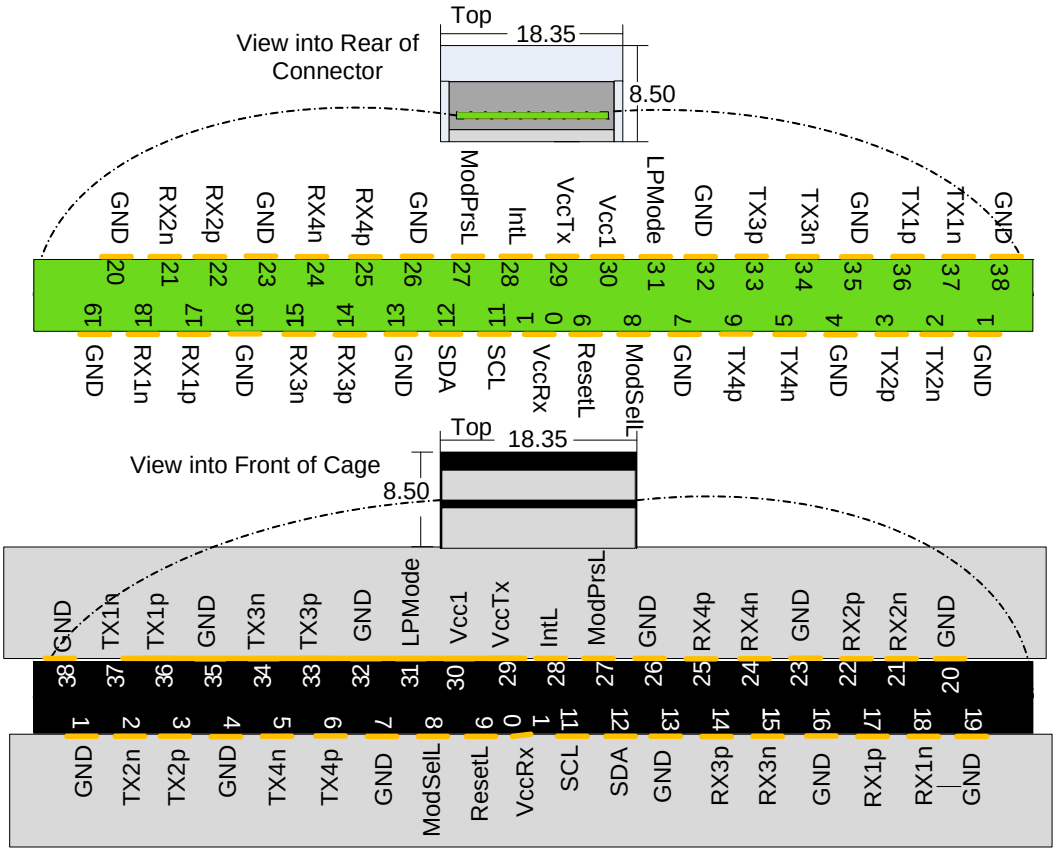


Table 15 - InfiniBand QSFP Connector Pinout

Connector Pin Number	Connector Pin Name	Signal Description
1	GND	Ground
2	Tx2n	Transmitter Inverted Data Input
3	Tx2p	Transmitter Non-Inverted Data Input
4	GND	Ground
5	Tx4n	Transmitter Inverted Data Input
6	Tx4p	Transmitter Non-Inverted Data Input
7	GND	Ground
8	ModSelL	Module Select
9	ResetL	Module Reset
10	Vcc Rx	+3.3 V Power supply receiver
11	SCL	2-wire serial interface clock
12	SDA	2-wire serial interface data
13	GND	Ground
14	Rx3p	Receiver Non-Inverted Data Output
15	Rx3n	Receiver Inverted Data Output
16	GND	Ground
17	Rx1p	Receiver Non-Inverted Data Output
18	Rx1n	Receiver Inverted Data Output
19	GND	Ground
20	GND	Ground
21	Rx2n	Receiver Inverted Data Output 3
22	Rx2p	Receiver Non-Inverted Data Output 3
23	GND	Ground
24	Rx4n	Receiver Inverted Data Output 3
25	Rx4p	Receiver Non-Inverted Data Output 3
26	GND	Ground
27	ModPrsL	Module Present
28	IntL	Interrupt
29	Vcc Tx	+3.3 V Power supply transmitter
30	Vcc 1	+3.3 V Power Supply
31	LPMode	Low Power Mode
32	GND	Ground
	Tx3p	Transmitter Non-Inverted Data

Figure 34: QSFP Connector Male and Female Views


Top
View into Rear of Connector
18.35
8.50
GND RX2n RX2p GND RX4n RX4p GND ModPrsL IntL VccTx Vcc1 LPMode GND TX3p TX3n GND TX1p TX1n GND
20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
GND RX1n RX1p GND RX3n RX3p GND SDA SCL VccRx ResetL ModSelL GND TX4p TX4n GND TX2p TX2n GND
Top
View into Front of Cage
18.35
8.50
GND TX1n TX1p GND TX3n TX3p GND LPMode Vcc1 VccTx IntL ModPrsL GND RX4p RX4n GND RX2p RX2n GND
38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
GND TX2n TX2p GND TX4n TX4p GND ModSelL ResetL VccRx SCL SDA GND RX3p RX3n GND RX1p RX1n GND

Appendix C: RJ-45 CONSOLE and Ethernet interfaces

The RJ-45 CONSOLE and Ethernet interfaces uses the EIA 568A standard wiring color coding.

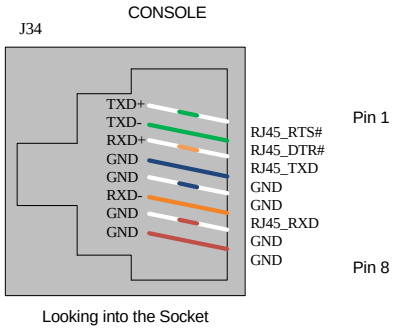
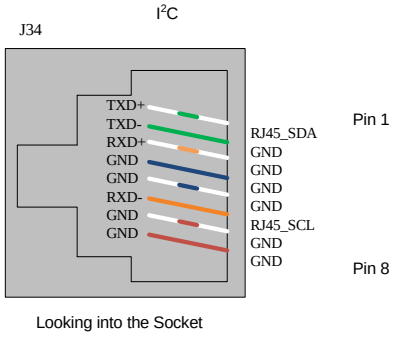


Table 16 - RJ-45 Pinout

Connection	Signal	Pin#	Color
TXD+	RJ-45_RTS#	1	G/W
TXD-	RJ-45_DTR#	2	G
RXD+	RJ-45_TXD	3	O/W
GND	GND	4	Bl
GND	GND	5	Bl/W
RXD-	RJ-45_RXD	6	O
GND	GND	7	Br/W
GND	GND	8	Br



Appendix D: Accessory and Replacement Parts

Table 17 - Replacement Parts Ordering Numbers

Part Description	OPN
I2C DB9 or RJ-45 to USB Adapter	MTUSB-1
Fan module with power supply side to connector side air flow	MSX60-FF
Fan module with connector side to power supply side air flow	MSX60-FR
300W Power Supply w/ Power Supply Side to Connector side air flow	MSX60-PF
300W Power Supply w/ Connector side to Power Supply side air flow	MSX60-PR
Power cord Type C13-C14	ACC000500
Installation Kit for short switches in racks 40-60 cm deep	MSX60-BKIT
Installation Kit for short or standard switches in racks 60-80 cm deep	MSX60-SKIT

Appendix E: Avertissements de sécurité d’installation (French)

1. Instructions d’installation

Lisez toutes les instructions d’installation avant de brancher le matériel à la source d’alimentation électrique.

2. Température excessive

Ce matériel ne doit pas fonctionner dans une zone avec une température ambiante dépassant le maximum recommandé de 45°C (113°F). Un flux d’air de 200LFM à cette température ambiante maximale est nécessaire. En outre, pour garantir un bon écoulement de l’air, laissez au moins 8 cm (3 pouces) d’espace libre autour des ouvertures de ventilation.

3. Empilage du châssis

Le châssis ne doit pas être empilé sur un autre matériel. Si le châssis tombe, il peut provoquer des blessures corporelles et des dégradations de biens.

4. Connection d'Alimentation electrique excedentaire -dangers électriques

Ce produit comporte un couvercle transparent sur l’espace pour l’alimentation électrique redondante.
Ne pas faire fonctionner le produit si le couvercle transparent n’est pas solidement fixé ou s’il est enlevé.

5. Système de fusible neutre/à double pôle

Avertissement: Système de fusible neutre/à double pôle. Veuillez debrancher tous les cordons d'alimentation avant d'ouvrir le boitier de ce produit ou de toucher un de ses composants internes.

6. Orages – dangers électriques

Pendant un orage, il ne faut pas utiliser le matériel et il ne faut pas brancher ou débrancher les câbles.

7. Branchement/débranchement des câbles en cuivre

Les câbles InfiniBand en cuivre sont lourds et ne sont pas flexibles, il faut donc faire très attention en les branchant et en les débranchant des connecteurs. Consultez le fabricant des câbles pour connaître les mises en garde et les instructions spéciales.

8. Risque de choc et de danger

Risque de choc et de danger
e'lectriques. Le de'branchment d'une seule alimentation stabilise'e ne de'branch uniquement qu'un module "Alimentation Stabilise'e". Pour isoler completement le module en cause, Il faut de'brancher toutes les alimentations stabilise'es

Risk of electric shock and energy hazard.
The PSUs are all independent.
Disconnect all power supplies to ensure a powered down state inside of the switch platform.

9. Montage et entretien sur baie

Lorsque ce produit est monté ou entretenu sur baie, il faut prendre des précautions spéciales pour s'assurer que le système reste stable. En général, il faut remplir la baie avec du matériel de bas en haut.

10. Fuite>3.5mA Leakage >3.5mA

« ATTENTION – La connexion à la terre des forts courants de fuite est essentielle avant le branchement de l'alimentation. »
Avant de brancher l'appareil à la conduite d'alimentation, les vis de protection à la terre du terminal de l'appareil doivent être appliquées à l'installation de protection à la Terre du bâtiment.

11. Forts Courants de Fuite High Leakage Current

Attention: Forts courants de fuite. Il est essentiel de relier a la terre avant de brancher l'alimentation.

12. Ajouter une information de connexion à la masse Connect a Valid Ground to this Device

Avant de brancher l'appareil à la conduite d'alimentation, les vis de protection à la terre du terminal de l'appareil doivent être appliquées à l'installation de protection à la Terre du bâtiment.

13. Installation du matériel

Ce matériel ne doit être installé, remplacé ou entretenu que par du personnel formé et qualifié.

14. Elimination du matériel

L'élimination de ce matériel doit s'effectuer dans le respect de toutes les législations et réglementations nationales en vigueur.

15. Codes électriques locaux et nationaux

Ce matériel doit être installé dans le respect des codes électriques locaux et nationaux.

16. Codes d'installation

L'appareil doit être installé selon l'ancienne version des codes électriques nationaux du pays. Pour l'Amérique du Nord, l'équipement doit être installé conformément aux spécifications du Code Electrique National Américain et du Code Electrique Canadien.

17. Interconnexion des unites

Les câbles de branchement à l'unité RS232 et les interfaces Ethernet doivent être certifiés UL de type DP-1 ou DP-2. (Note - lorsqu'il existe dans un circuit non LPS)
Protection contre la surintensité : Un appareil de protection répertorié facilement accessible contre la surintensité du circuit de branchement et calibré à 20A doit être incorporé dans le câblage électrique du bâtiment.

18. Exposition au rayonnement grave

Mise en garde – l'utilisation de commandes ou de réglages ou l'exécution de procédures autres que ce qui est spécifié dans les présentes peut engendrer une exposition au rayonnement grave.

PRODUIT LASER DE CLASSE 1 » et références aux normes laser les plus récentes CEI 60 825-1:1993 + A1:1997 + A2:2001 et NE 60825-1:1994+A1:1996+ A2:2001

19. S’assurer que les enceintes sont appropriées

Des enceintes électriques, mécaniques et incendie adaptées doivent être fournies par le fabricant du produit final ou par l’utilisateur final.

20. Cordons électriques CA homologués UL

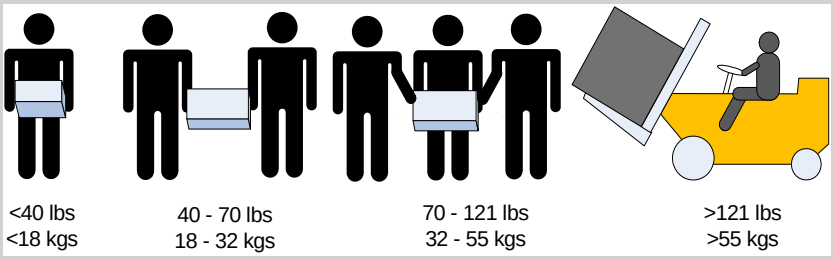
Pour les prises électriques en Amérique du Nord, choisissez un cordon électrique homologué UL et certifié CSA

à 3 conducteurs, [18 AWG], terminé par une fiche moulée, d’une tension nominale de 125 V, [15 A], avec une longueur minimale de 1,5 m [6 pieds] et d’une longueur maximale de 4,5 m [18 pieds]

Pour les prises électriques en Europe, choisissez un cordon électrique harmonisé internationalement et marqué "<HAR>",

à 3 conducteurs, d’un diamètre de fil minimum de 0,75 mm2, d’une tension nominale de 300 V, avec une gaine isolée en PVC. Le cordon doit avoir une fiche moulée d’une tension nominale de 250 V et d’une intensité nominale de 10 A.

21.



22. Conformément à la Directive WEEE

Conformément à la Directive WEEE 2002/96/EC, les déchets d'équipements électriques et électroniques (EEE) doivent être triés et ne peuvent être éliminés avec les déchets ménagers.

Veuillez disposer de ce produit et de tous ses composants de manière responsable et respectueuse de l’environnement.

Appendix F: Installation - Sicherheitshinweise (German)

1. Installationsanleitungen

Lesen Sie alle Installationsanleitungen, bevor Sie das Gerät an die Stromversorgung anschließen.

2. Übertemperatur

Dieses Gerät sollte nicht in einem Bereich mit einer Umgebungstemperatur über der maximal empfohlenen Temperatur von 45°C (113°F) betrieben werden. Es ist ein Luftstrom von 200 LFM bei maximaler Umgebungstemperatur erforderlich. Außerdem sollten mindestens 8 cm (3 in.) Freiraum um die Belüftungsöffnungen sein, um einen einwandfreien Luftstrom zu gewährleisten.

3. Stapeln des Chassis

Das Chassis sollte nicht auf andere Geräte gestapelt werden. Wenn das Chassis herunterfällt, kann es zu Verletzungen und Beschädigungen an Geräten führen.

4. Redundanter Stromversorgungsanschluss - Elektrische Gefahr

Dieses Produkt verfügt über eine Abdeckung über dem Bereich für die redundante Stromversorgung. Betreiben Sie das Produkt nicht, wenn diese Abdeckung nicht sicher festsitzt oder entfernt wurde.

5. Bei Gewitter - Elektrische Gefahr

Arbeiten Sie während eines Gewitters und Blitzschlag nicht am Gerät, schließen Sie keine Kabel an oder ab.

6. Anschließen/Trennen von Kupferkabel

Kupferkabel sind schwer und nicht flexible. Deshalb müssen sie vorsichtig an die Anschlüsse angebracht bzw. davon getrennt werden. Lesen Sie die speziellen Warnungen und Anleitungen des Kabelherstellers.

7. Gafahr des elektrischen Schocks.

Gafahr des elektrischen Schocks. Entferrnen des Netzsteckers elnes Netzteils spannungsfrei. Um alle Einhieten spannungsfrei zu machen sind die Netzstecker aller Netzteile zu entfernen

Risk of electric shock and energy hazard.
The PSUs are all independent.
Disconnect all power supplies to ensure a powered down state inside of the switch platform.

8. Rack-Montage und Wartung

Wenn dieses Produkt in einem Rack montiert oder gewartet wird, sind besondere Vorsichtsmaßnahmen zu ergreifen, um die Stabilität des Systems zu gewährleisten. Im Allgemeinen sollten Sie das Gestell von unten nach oben mit Geräten füllen.

9. Geräteinstallation

Diese Gerät sollte nur von geschultem und qualifiziertem Personal installiert, ausgetauscht oder gewartet werden.

10. Geräteentsorgung

Die Entsorgung dieses Geräts sollte unter Beachtung aller nationalen Gesetze Bestimmungen erfolgen.

11. Regionale und nationale elektrische Bestimmungen

Dieses Gerät sollte unter Beachtung der regionalen und nationalen elektrischen Bestimmungen installiert werden.

12. Richtigen Schutz sicherstellen

Geeigneter elekrischer, mechanischer und Feuerschutz sind vom Hersteller des Endprodukts oder dem Endbenutzer bereitzustellen.

13. Strahlenkontakt

Achtung – Nutzung von Steuerungen oder Einstellungen oder Ausführung von Prozeduren, die hier nicht spezifiziert sind, kann zu gefährlichem Strahlenkontakt führen..

Klasse 1 Laserprodukt und Referenzen zu den aktuellsten Lasterstandards :
ICE 60 825-1:1993 + A1:1997 + A2:2001 und EN 60825-1:1994+A1:1996+ A2:2001

14. UL-und CSA Certified Netzkabel

Für Nordamerika Stromanschluss, wählen Sie ein Netzkabel, das UL-und CSA Certified

3 - Leiter, [18 AWG], mit einem angespritztem Stecker bewertet bei 125 V, [15], mit einer Mindestlänge von 1,5 m [Six Feet] aber nicht mehr als 4,5 m.

Für die europäischen Zusammenhang, wählen Sie ein Netzkabel, das international harmonisiert und der Aufschrift "<HAR>",

3 - Leiter, mindestens 0,75 mm2 Draht, bewertet mit 300 V, mit einem PVC-Mantel isoliert. Das Kabel muss eine angespritztem Stecker bewertet bei 250 V, 10 A. "

15. Ableitstrom> 3.5mA LEAKAGE >3.5mA

WARNUNG: Hohe Ableitstrom; Earth Verbindung, bevor Sie die Verbindung von wesentlicher Bedeutung werden.

16. Add GND Verbindung Informationen

Bevor Sie dieses Gerät an das Stromnetz, die Schutzerde Terminal Schrauben dieses Gerät muss an den Schutzleiter in der Gebäudeinstallation.

17. Installation Codes

Dieses Gerät muss installiert sein, entsprechend auf die neueste Version des Landes National Electrical Code. Für Nordamerika, müssen in Übereinstimmung mit den geltenden Vorschriften in der US-amerikanischen National Electrical Code und dem Canadian Electrical Code.

18. Zusammenschaltung von EINHEITEN

Kabel für den Anschluss an das Gerät RS232-und Ethernet-Schnittstellen müssen UL zertifiziert Typ DP-1 oder DP-2. (Hinweis-, wenn nicht mit Wohnsitz in LPS-Schaltung)

Überstromschutz: Eine leicht zugängliche Auflistung Abzweigleitung Überstrom-Schutzeinrichtung 20 A bewertet werden müssen in dem Gebäude Verkabelung.

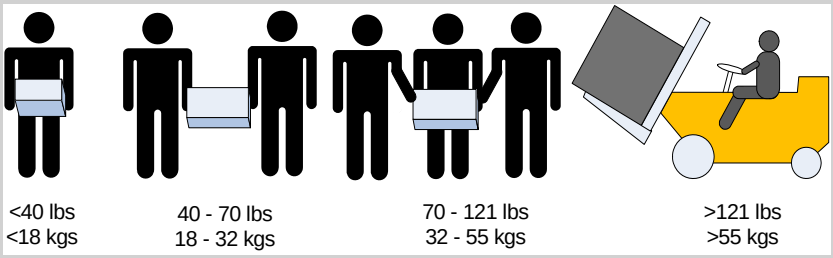
19. Zweipolige bzw. Neutralleiter-Sicherung im Netzteil

Achtung:

Zweipolige bzw. Neutralleiter-Sicherung im Netzteil. Netzstecker ziehen, um sicherzustellen, daß keine Spannung am Gerät anliegt. Entfernen Sie alle Netzkabel vor dem Öffnen der Abdeckung dieses Produkts oder dem Berühren der Innenteile.

20. Bodily Injury Due to Weight

Use enough people to safely lift this product.

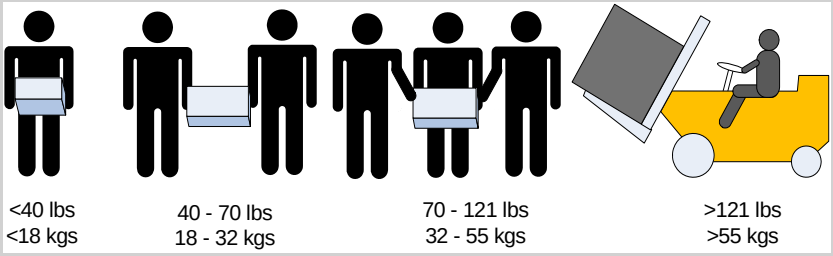


Appendix G: Advertencias de seguridad para la instalación (Spanish)

1. Instrucciones de instalación

Antes de conectar el equipo a la fuente de alimentación, leer todas las instrucciones de instalación.

2. Lesión corporal por peso



3. Lesión corporal por peso

This equipment is very heavy and should be moved using a mechanical lift to avoid injuries.

4. Sobrecalentamiento

No se debe utilizar el equipo en un área con una temperatura ambiente superior a la máxima recomendada: 45°C. Además, para garantizar una circulación de aire adecuada, se debe dejar como mínimo un espacio de 8 cm (3 pulgadas) alrededor de las aberturas de ventilación.

5. Apilamiento del chasis

Los chasis no se deben apilar sobre otros equipos. La caída del chasis podría causar lesiones corporales, así como daños al equipo.

6. Dos fusibles, uno en el polo y otro en el neutro

Dos fusibles, uno en el polo y otro en el neutro. Quitar los cables de corriente antes de abrir la tapa de este producto o tocar cualquier componente interno.

7. Cuando hay rayos: peligro de descarga eléctrica

No utilizar el equipo ni conectar o desconectar cables durante períodos de actividad de rayos.

8. Conexión y desconexión del cable Copper

Dado que los cables de cobre son pesados y no son flexibles, su conexión a los conectores y su desconexión se deben efectuar con mucho cuidado. Para ver advertencias o instrucciones especiales, consultar al fabricante del cable.

9. Montaje y mantenimiento de bastidores

Al instalar o realizar el mantenimiento de este aparato en un bastidor, es preciso adoptar precauciones especiales para garantizar que el sistema se mantenga estable. En general, en un bastidor, los equipos se deben instalar comenzando desde abajo hacia arriba.

10. Instalación de equipos

La instalación, el reemplazo y el mantenimiento de este equipo estarán a cargo únicamente de personal capacitado y competente.

11. Asegurar confinamientos adecuados

El fabricante del producto final o el usuario final deberán suministrar un confinamiento adecuado para componentes eléctricos y mecánicos y contra incendio.

12. Eliminación de equipos

La eliminación definitiva de este equipo se debe efectuar conforme a todas las leyes y reglamentaciones nacionales.

13. Códigos eléctricos locales y nacionales

Este equipo se debe instalar conforme a los códigos eléctricos locales y nacionales.

14. Cable de alimentación homologado por UL y con certificación CSA

En conexiones de América del Norte, seleccionar un cable de alimentación homologado por UL y con certificación CSA de tres conductores, [16 AWG], terminado en un enchufe moldeado con capuchón de 125 voltios nominal, [13 A], con una longitud mínima de 1,5 metros, pero no más de 4,5 metros.

En conexiones europeas, seleccionar un cable de alimentación armonizado internacionalmente y marcado "<HAR>", de tres conductores, hilo de 1,0 mm2 como mínimo, 300 voltios nominal, con cobertura protectora aislante de PVC. El cable debe tener un enchufe moldeado con capuchón de 250 voltios nominal, 10 A.

15. Añadir conexión a tierra

Antes de conectar el dispositivo a la línea de alimentación, los tornillos del terminal de la puesta a tierra de protección del dispositivo se deben conectar a la puesta a tierra de protección de la instalación del edificio.

(Información de conexión a tierra):

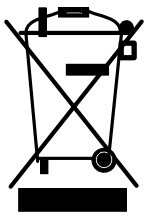
La instalación del edificio deberá prover un medio para la conexión con la puesta a tierra de protección y un técnico de servicio deberá conectar permanentemente el equipo a dicho medio de conexión.

Un TÉCNICO DE SERVICIO comprobará si la toma eléctrica de la que se suministrará corriente al equipo provee una conexión con la puesta a tierra de protección del edificio. De no ser así, el TÉCNICO DE SERVICIO se encargará de instalar un CONDUCTOR DE CONEXIÓN A TIERRA DE PROTECCIÓN, del terminal de puesta a tierra de protección separado al conductor de tierra de protección del edificio. El equipo se instalará en un área donde haya conexión equipotencial, como por ejemplo, un centro de telecomunicaciones o una sala de computadoras dedicada.

16. Códigos de instalación

Este dispositivo se debe instalar conforme a la versión más reciente de los códigos eléctricos nacionales del país en cuestión. En América del Norte, el equipo se debe instalar de acuerdo con las disposiciones vigentes del Código Eléctrico Nacional de los EE.UU. y del Código Eléctrico de Canadá.

17. Directiva sobre RAEE



Conforme a la Directiva 2002/96/CE sobre RAEE, todos los residuos de equipos eléctricos y electrónicos (EEE) se deben recolectar por separado y no se deben eliminar junto con residuos domésticos.

Al deshacerse de este producto y de todas sus partes, hágalo de una manera responsable y respetuosa con el medio ambiente.